



TALLINN UNIVERSITY OF
TECHNOLOGY

FACULTY OF CIVIL ENGINEERING
DEPARTMENT OF ENVIRONMENTAL ENGINEERING

**REQUIREMENTS FOR THE MASTER'S THESES AT THE
DEPARTMENT OF ENVIRONMENTAL ENGINEERING OF THE
FACULTY OF CIVIL ENGINEERING**

Speciality: Environmental Engineering and Management

1. Introduction

These requirements are valid for the graduation theses of Master's study submitted to be defended at the Department of Environmental Engineering of the Faculty of Civil Engineering of TUT.

The requirements were prepared based on the following documents:

1. **Regulations on Completion of Studies** (established by TUT Council Regulation No. 5 of 18.11.2008)
2. **Academic Policies of Tallinn University of Technology** (established by TUT Council Regulation No. 4 of 16.06.2009; amended by TUT Council Regulation No. 12 of 15.12.2009)
3. **Estonian universities' agreement on good practice regarding quality of study programmes, academic positions and academic degrees** (12 June 2006)

Support materials for preparing graduation theses:

1. Väino Rajangu. Abiks magistri- ja doktoritöö koostajaile. Tallinn, Tehnikaülikool, Haldusuuringute keskus, 2001, 57 lk.
2. Silvi Roomets. Üliõpilastööd ja nende vormistamine arvutil. Tallinn, AS Rebelis, 2002, 44 lk
3. Eedo Kalle, August Aarma. Teadustöö alused. Tallinn, Tallinna Tehnikaülikool, 2003, 131 lk.

2. Topic of graduation thesis and selection of the supervisor

(1) The topic of graduation thesis shall comply with the content of the study programme. If necessary, the topic of graduation thesis will be coordinated with the study programme committee before starting to prepare thesis. Generally, a graduation thesis is prepared in the language of instruction. Master's theses are generally prepared in the language of instruction. A thesis prepared in a foreign language shall include an Estonian summary, except in case of the graduation theses of foreign students studying based on international degree study programmes.

A graduation thesis is prepared at a department, centre or institution of TUT under the supervision of a specialist with necessary experience, who has a diploma or academic degree or relevant qualification equal the diploma or academic degree to be issued to the student. A co-supervisor from TUT or from outside can be consulted, if necessary. Consent of the Dean is required for supervision of graduation thesis outside the faculty.

A student can choose the topic of graduation thesis as follows:

- Takes the topic from a company; in such a case, a contract will be concluded between TUT and the company for completing the thesis, if necessary.
- Competes for research or development topics offered by the department of the teacher supervising the thesis (list of theses is available from the assistant of the director of relevant department as of the beginning of the spring semester).

The task of the supervisor is to guide the student in planning and preparing the thesis and to provide advice for substantive solution of problems. The supervisor will draft an objective of the thesis for the preparation of the graduation thesis, which sets and specifies the tasks to be completed in the graduation thesis. The supervisor is responsible for the conformity of the graduation thesis to the requirements set for an academic degree.

If necessary, the student preparing graduation thesis is entitled to get consultation on economic, legal, safety or other issues on a general bases in relevant chairs and teaching units.

3. Requirements for graduation theses

A student shall prepare the graduation thesis independently. A student is responsible for the content and quality of the thesis and correctness of materials and solutions submitted in the thesis.

The graduation thesis shall be independent research or development paper, containing analysis of a speciality-related problem, setting and completion of a task. A theoretical graduation thesis is an independent research with the volume of at least a scientific article, containing setting, overview, analysis and solution of a problem within a specific profession. A practical graduation thesis is a thesis of investigative or developmental nature. Investigative theses describe and analyse a speciality-related problem based on a research methodology. Graduation thesis indicates the student's ability to analyse independently the research field, using the methods of scientific research.

A theoretical and investigative graduation thesis includes introduction, providing overview of the problem and former similar papers. The introduction is followed by setting the task of the graduation thesis, description of the problem and explanation of the need for its solution. The following chapters include theoretical solution of the research performed by the student or results of experimental research. The experimental part of a graduation thesis shall include description of the test device, used instruments and their position on the model, presentation of interpretation methods of test results and the gained results and their analysis. Graduation thesis shall include a summary, also in foreign language, presenting the research results and a list of bibliography. Basic volume of the abovementioned graduation thesis should not be less than 60 pages and during defending, the results may be disclosed in the form of a computer presentation.

The graduation thesis shall include a summary in a foreign language with the length of at least 1 page. Graduation thesis shall be submitted printed and bound together in at least 2 copies, and the part of graduation thesis containing text and illustrations shall be additionally prepared in *pdf format, which will be the basis for solution of later disputes according to the procedure specified by law. A CD with the total volume of the graduation thesis will be appended.

Graduation theses are stored in a relevant department (institution, centre) for at least five years.

4. Eligibility for defence and the relevant documents

The precondition for eligibility of a graduation thesis for defence is the fulfilment of all graduation requirements of the study programme.

Graduation requirements in Master's study include the completion of the study programme in full extent and defending of a graduation thesis. The weighted average grade shall be at least 2.0. Preconditions for a cum laude diploma are the following: weighted average grade of at least 4.60, all grades 3 or higher, and grade of the graduation thesis 5. As a result of a successful defence of the graduation thesis, the students graduating from Master's study will receive an academic degree of Master of Science in Engineering. A graduate will submit an application for the defence of graduation thesis in the study information system (ÕIS) no later than one week before the term of submission of defence applications specified in the academic calendar. A graduate will submit a printout of the application from ÕIS, superscribed by the supervisor, to the Dean's office of his/her faculty. It shall be verified within a week at the Dean's office, whether the graduate has fulfilled all eligibility requirements. The accounting and budget department will submit an invoice to a student studying on a non-state-commissioned place based on a credit fee, who has not paid the supervision fee, and to an external student, based on a proposal of the Dean's office in two business days after the receipt of the application.

If eligibility requirements are fulfilled, the Dean will superscribe the application. Application of a student studying on a non-state-commissioned place and an external student will be superscribed after the payment of the invoice.

A graduate from Master's studies will submit the finalised graduation thesis to the defence committee by the term of submission of defence application specified in the academic calendar (if the department has not set other requirements).

The defence committee will announce the defence date after verifying that the graduation thesis conforms to the content of the study programme, profile of the committee and the requirements set to graduation theses.

If the submitted thesis meets the requirements set to graduation theses, the supervisor will recommend, as approved by the chairman of the defence committee, one (in exceptional cases two) reviewer/opponent to the graduation thesis (no later than 10 days before the defence date), who has a Master's degree or at least equivalent academic degree. The reviewer may introduce the review to the student before defence. Errors and shortages noted by the reviewer may not be corrected before defence. The reviewer shall assess the graduation thesis according to the assessment system used at TUT. Written opinions of reviewers shall be available to the graduate and members of the defence committee at least two days before the defence.

If the defence committee finds that the submitted graduation thesis does not meet the requirements, the thesis will be returned to the student in one week together with a motivated letter.

5. Defence

Master's theses are defended generally in the defence periods specified in the academic calendar (twice a year). Defence may also take place any other time during the academic year. The defence committee, who announces the defence dates at least two weeks before defence, makes the respective decision.

As a rule, a graduation thesis shall be defended at a public session of the defence committee (except making a decision). The chair of the defence committee shall decide the need for a closed session (with registered participants). The time and place of the public session and list of the students permitted to the defence shall be disclosed on the notice board of the department/centre and web page of the faculty or the department/centre no later than three days before the defence.

The graduation thesis shall be defended at a session of the defence committee in the form of public academic discussion, and it can take place only in the presence of the graduate and at least one reviewer/opponent.

The defence committee has quorum, if at least 2 members of the committee with relevant degree are present together with additional members.

The following shall be submitted to a defence committee in order to conduct a defence session:

1. standard-format defence application;
2. graduation thesis;
3. standard-format transcript of records signed by the employee appointed by the Dean;
4. reviews;
5. the supervisor's opinion of the graduate and the graduation thesis;
6. additional materials appended by the graduate (if necessary).

Main stages of the defence procedure are as follows:

1. introduction of the documents submitted for defence;
2. the graduate's presentation;
3. hearing the reviews and answering the questions;
4. general discussion (all those present may ask questions and give their opinions);
5. making a decision.

The working language of the defence committee session shall be determined by the chair of the defence committee; as a rule, the working language is the study language.

The defence committee shall decide on awarding a relevant degree to the graduate in a closed session. Graduation theses and the defence thereof shall be assessed based on the TUT assessment system. All positive grades mean that the thesis is defended successfully.

Minutes of the defence committee shall be submitted to the Dean's office of the faculty. Minutes of the defence committee shall be preserved without a term. Other defence documents (defence application, reviews, supervisor's opinion etc.) shall be preserved pursuant to the procedure established by the Dean.

6. Recommendations to the reviewer

A review should point out the following:

- Actuality of the topic;

- Conformity of the thesis to the topic and the set objective, level of elaboration;
- Consistency of the structure of the thesis and balance of structural parts;
- Supply of figures and numerical data (depending on the topic);
- Assessment of the sufficiency and topicality of bibliography;
- Style of the thesis and use of professional language;
- Consistency of text and appendices (if any);
- Novelty of solutions, consistency and validity of conclusions and proposals;
- Opinion of the reviewer of personal contribution of the author;
- Other notes about the thesis;
- Which questions the student should answer additionally;
- General assessment of the thesis (according to the assessment system provided below) and its conformity to the requirements set to a graduation thesis of relevant level.

The following assessment system is used in Tallinn University of Technology:

„5“ – excellent

„4“ – very good

„3“ – good

„2“ – satisfactory

„1“ – poor

„0“ – failed

The following data shall also be noted in the review:

Level of education or academic degree of the reviewer

Place of work and position of the reviewer

7. General requirements for preparing a graduation thesis

Structure of a graduation thesis

- Title page (see Appendix 1)
- Author's declaration (see Appendix 2)
- Initial task
- Table of contents
- Introduction
- Suitably structured main text
- Summary in Estonian
- Summary in a foreign language
- List of references and bibliography
- Appendices (if necessary)

Main text and headings

The thesis shall be drafted as a composite whole, using similar drafting principles consistently. The thesis shall be printed in black and white on one side of white writing paper and bound with covers (hard-back or spiral-bound) in format A4. In case of drawings and pictures, colour print may also be used. If necessary, the tables, drawings and appendices may have different formats, but no smaller than A4 and not larger than A3. In the case of A3, the sheets shall be folded suitably inside the thesis.

Most common typefaces should be preferred for the text (Arial, Times New Roman), with font size 12 points and line spacing 1.5. A sheet shall have 2.5 cm free edge space at the top, at the bottom and in the right side, and 3 cm on the left side (to ensure space for hard-back binding). Text shall be aligned to both edges (mode – *justified*).

In heading design, it is allowed to choose different typeface, font size and position of text. Headings and subheadings shall be clearly distinguishable.

All pages of the thesis belong into an integral numerical count (including the sheets, which include only separate tables and drawings). Numbers are located in the bottom right corner of the page, starting from the page with a table of contents. Pages are counted from the title page. All pages of the thesis are numbered through the entire thesis, but numbers are not entered on the title page (page 1) or its reverse side (page 2), also on the pages with the table of contents.

It is recommended not to end a chapter with a table or a drawing, but with text.

Tables

Tables are used to present general and systematic numerical data. Tables are provided with a number and title. Numbers can be assigned continuously through the entire thesis (*Table 12*) or by every major numbered part (section, chapter) (*Table 3.2*). As a rule, the number of a table is located (without the abbreviation No.) on the left before the title. Title of a table is aligned left. Length of the title should not exceed width of the table. No full stop is inserted at the end of the title. Tables shall be linked to the text with a reference. Table is located as close as possible to the text section containing the first reference to the table.

Example:

A country-wise annual nutrient input reduction targets were proposed (Table 3.2) and actions should be agreed no later than in 2016.

Table Error! No text of specified style in document..1 Country-wise provisional nutrient reduction requirements agreed by the ministers of the environment of the Member States of HELCOM [1]

| Country | Phosphorus (tonnes) | Nitrogen (tonnes) |
|----------------|----------------------------|--------------------------|
| Denmark | 16 | 17,210 |
| Estonia | 220 | 900 |
| Finland | 150 | 1,200 |
| Germany | 240 | 5,620 |
| Latvia | 300 | 2,560 |
| Lithuania | 880 | 11,750 |

| | | |
|----------------------------|-------|--------|
| Poland | 8,760 | 62,400 |
| Russia | 2,500 | 6,970 |
| Sweden | 290 | 20,780 |
| Transboundary Common pool* | 1,660 | 3,780 |

* coming from transboundary waterborne pollution originating in Belarus

Table should not (usually) be split, it should be presented on a single page. If a table is split, headers of the table shall also be transferred, in order to ensure legibility. A split table shall be equipped with a title (e.g.: Table 2.3 continued 1, Table 2.3 continued 2 etc.).

Larger tables and tables with initial data shall be located in an appendix to the written thesis.

Drawings

Drawings (including photos) are numbered like tables, either continuously through the entire thesis (*Figure 15*) or by every major numbered part (section, chapter) (*Figure 3.7*). In addition to the sequential number, a drawing requires also a description of the content in the subtext. No full stop is inserted at the end of the subtext. Subtext of a drawing is aligned left and length of a row should not exceed width of the drawing.

Example:

Most of phosphorus (12 tons) and nitrogen (91 tons) reduction should be achieved by reducing their load into inland water bodies in the category below 2,000 PE (Figure 3.7).

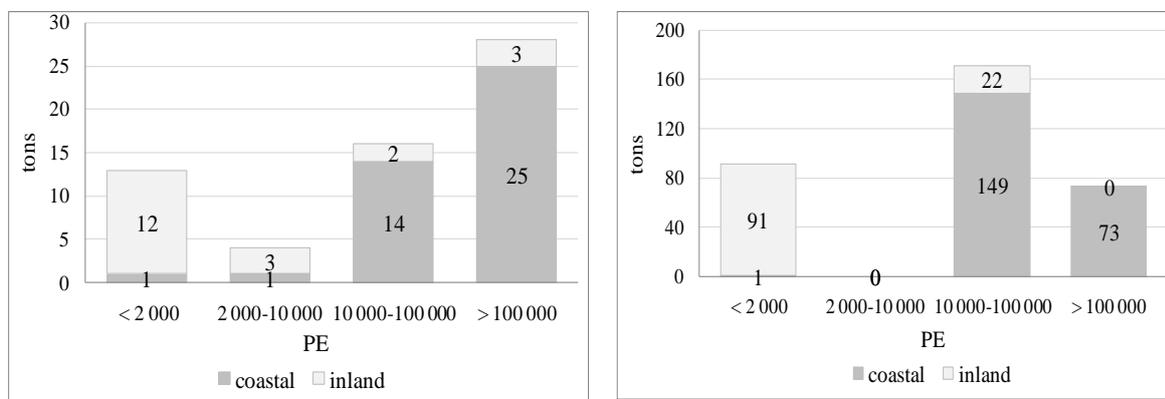


Figure 3.7 Total phosphorus (left) and nitrogen (right) potential reduction in Gulf of Finland catchment area, tons

Equations

Calculation method of all mathematical expressions included in the letter of explanation shall be explained. Equations taken from literature require reference to the source. In case of derived equations, the basic equations shall be presented together with an explanation of the method of derivation, conditions and simplifying preconditions. In a thesis, it is recommended to use common style for presentation of equations and mathematical expressions. Common signs shall be used in equations. Explanations of signs are located after the equation in the order of their occurrence.

Equations are numbered continuously through the entire written thesis. Numbers are placed in round parentheses and positioned after the equation in the right edge of the page.

$$A + \frac{365}{n}, A + \frac{365 \times 2}{n}, A + \frac{365 \times 3}{n}, \dots, A + \frac{365 \times n}{n} \quad (4)$$

where

A random number between $-365 / n$ and 0

n number of samples

Summary

The summary provides short comment to the work done and presents (personal) experience of the drafter of the thesis together with practical value of the thesis. Estimated volume of the summary is 1-2 pages.

The summary provides answers to the questions raised in the introduction and reveals solution options of the set tasks and the gained results. The main tasks of the summary are as follows:

- 1) To present briefly the main results, conclusions, assessments, proposals etc. developed in the main part of the thesis;
- 2) To highlight possibilities for use and development of conclusions and proposals made in the thesis and any problems needing further solution.

In the summary, the objective shall not be repeated, no new problems shall be set, no opinions or conclusions shall be presented in the issues, which have not been covered earlier in the thesis. Equal attention shall be paid to all parts of the thesis in the summary. The summary is not a mechanical assembly of text sections from previous parts of the thesis. No references are made to bibliographical sources and no opinions or conclusions originating from other authors are presented in the summary. However, the summary shall show clearly the contribution of the student to the fulfilment of the objective and research tasks set in the introductory part of the thesis.

Summary in a foreign language

Upon presentation of the summary in foreign language, first the word “Summary” is written in English or in German (Summary or Zusammenfassung, respectively) as the title of the main part of the thesis. This will be followed by the translated title of the thesis (with capital letters) with name and surname of the author underneath (both aligned in the centre of the page), followed by text in a foreign language.

The summary shall provide an integral overview of the thesis. The summary shall provide a generalised and comprehensive overview of the thesis to a reader, who does not speak the language of the thesis, including the title, objective, main structure of the thesis and

description of the results obtained in the main part in a foreign language. The estimated volume of the summary is one page.

List of references

The list of references and bibliography shall include all sources referred to in the thesis. The author of the thesis can choose a suitable reference system from two main reference systems (name-year reference or numerical reference system). Each entry in the list of referred sources shall include at least the name of the author (if any), title, place and year of publication. References obtained from the Internet shall include, in addition to the precise address, also the date when the relevant information was obtained.

1. Book entry by the author

1.1 Name-year reference:

Author. Year of publication. Title: subtitle. Edition. Place of publication: publishing house.

Erelt, Tiiu. 1999. Eesti ortograafia. 3. tr. Tallinn: Eesti Keele Sihtasutus.

Tärno, Ülo. 2002. Glehni lossi kroonika. Tallinn: Tallinna Tehnikaülikooli kirjastus.

Kasik, R. 1996. Eesti keele sõnatuletus. Tartu: Tartu Ülikooli Kirjastus.

ITKONEN, E. 1996. Kieli ja sen tutkimus. Helsinki.

LEVIN, BETH. 1993. English verb classes. Chicago: The University of Chicago Press.

1.2 Numerical reference, also in the list of references:

Author. Title: subtitle. Edition. Place of publication: publishing house, year of publication.
Total number of pages.

Ferdinand Petersen. Mälestusi ja tähelepanekuid. Tallinn: Tallinna Tehnikaülikooli kirjastus, 2001. 288 lk.

E. Vääri, R. Kleis ja J. Silvet. Võõrsõnade leksikon. 6. tr. Tallinn: Valgus, 2000. 1072 lk.

2. Book entry by the title

Title: subtitle/compiler(s); title editor. Edition. Place of publication: Publishing house, year of publication. Number of pages.

Microsoft Word 2000: Kasutaja teatmik/Koost. Jaak Kütt. Tallinn: Külim, 2000. 208 lk.

Ametniku keelekäsiraamat: Õigusaktide ja muude dokumentide koostaja abiline/Justiitsministeerium. Tallinn: Juura, 2000. 250 lk.

Tallinna Tehnikaülikooli aastaraamat/Koost. Vahur Mägi. Tallinn: Tallinna Tehnikaülikooli kirjastus, 2001. 396 lk.

Science editors' handbook/P. H. Enckell (editor). London: European Association of Science Editors, 1993. 572 lk

3. Article in a collection and serial publication

3.1 Name-year reference:

Author of the article. Year of publication. Title of the article. – Name and number of publication. Place of publication: publishing house, pages.

Raadik, M. 2000. Tsitaatsõnad. – Rmt: Keelenõuanne soovitab 2/Tiiu Erelt jt. Tallinn: Eesti Keele Sihtasutus lk 52.

Kübarsepp, J., Klaasen, H., Laansoo, A. 2002. TiC-base Cermet+Steel Dual Compounds Produced by Diffusion Bonding. *In: Proceedings of the 3rd International Conference of DAAAM National Estonia, Industrial Engineering – New Challenges to SME, 25–27 April 2002 Tallinn, Estonia.* Tallinn: Tallinn Technical University, p 173–176.

HINT, M. 1997. Eesti vajab eestikeelset teadust ja teadusterminoloogiat. – Teaduslugu ja nüüdisaeg X: Eesti teaduspoliitika ja teaduskorralduse probleeme. Tallinn, lk 136–141.

3.2 Numerical reference, also in the list of references:

Author of the article. Title of the article. – Name and number of publication/Collective author; compiler or editor. Place of publication: publishing house, year of publication.

Paul Alvre. Johannes Aaviku muutkondade süsteem. – Eesti Rahvusraamatukogu toimetised 3: Keelereform ja raamat. Tallinn, 1993, lk 85.

Raimund Ubar and Dominique Borrione. Single Gate Design Error Diagnosis in Combinational Circuits. – Proceedings of the Estonian Academy of Sciences 5 /1/ Hillar Aben (Editor-in-Chief). Tallinn: Estonian Academy Publishers, 1999, p. 3–21.

4. Article in a periodical or a newspaper

4.1 Name-year reference:

Author of the article. Year of publication. Title of the article. – Name of periodical or newspaper (without quotation marks), number of the periodical or date of issue of the newspaper, pages.

Kull, Rein. 2000. Oskuskeel ja üldkeel: erisused ja samasused. – Keel ja Kirjandus, nr. 8, lk 545–557.

HILL, J. Language death. *International Journal of the Sociology of Language*, no 12, p. 55–69.

PRAUST, V. 1997. Arvutialases keelekasutuses tehakse vigu. – Äripäev, 7. jaanuar, lk 20.

4.2 Numerical reference, also in the list of references:

Author of the article. Title of the article. – Name of periodical or newspaper, year of publication of the periodical, number, pages.

Lauri Mälksoo. Keel ja inimõigused. – Akadeemia 2000, nr. 3, lk 451.

E. RIIKOJA. Arvud kirjpildis. – Õiguskeel 1995, nr. 3, lk 24.

J. Kaplinski. Minu eesti keel. – Sirp 1994, 14. jaan, lk 2.

5. Electronic information sources

Description of electronic information sources is based on the same general rules, which are valid for books and articles. Address of the electronic source will be added.

5.1 CD-ROM:

Author, document title, name of periodical, title of CD-ROM, version, year.

King, J. Revenge of the IS Worker. Computerland 30 (41). CD-ROM, Computer Select, December 1996.

5.2 Web document:

Author, document title, location of the document (Internet address), date of use.

Grünthal, A. Välismaale sõites kustuta võlad, <http://www.liising.ee/hl/et/>, 11. veebruar 2000

5.3 Web article in an electronic periodical:

Author, document title, name of periodical, year of publication, number, location (Internet address), date of use.

Rommelg, A. Eesti peamine ressurss on inimkapital. Luup 2000, nr. 3, <http://www.postimees.ee/luup/00/03/maja2.shtm>, 11. veebruar 2000.



FACULTY OF CIVIL ENGINEERING
DEPARTMENT OF ENVIRONMENTAL ENGINEERING

TITLE OF MASTER'S THESIS IN ESTONIAN
TITLE OF MASTER'S THESIS IN ENGLISH
EABMLT

Student: Ants Lootus

Supervisor: Prof. Aino Kivi

Tallinn, 2014

(Reverse page of the title page)

Appendix 2

I have prepared the Master's thesis independently.
All papers of other authors, major opinions, and data originating from bibliographical and other sources have been referred.

..... (signature of the author and date)

Student code:

The thesis meets the requirements set to a Master's thesis

..... (signature of the supervisor and date)

Permitted to the defence (date)

Chair of the defence committee (signature)