

Approved  
At the Council meeting of the Faculty of Information Technology  
On February 7, 2007, protocol no. 1  
With amendments on 20.02.2008. protocol no. 1; 16.09.2009 protocol no. 7;  
15.09.2010 protocol no. 7; 21.09.2011 protocol no. 6;  
17.09.2014 protocol No. 7; 17.11.2015 protocol No. 7;  
11.10.2016 protocol No. 12.; 16.11.2022. Protocol no. 7

**LATVIA UNIVERSITY OF LIFE SCIENCES AND TECHNOLOGIES**  
**Faculty of Information Technologies**

**DEVELOPMENT AND DEFENCE OF THE MASTER'S  
THESIS OF ENGINEERING SCIENCES IN THE STUDY  
PROGRAM "INFORMATION TECHNOLOGIES"**

**Methodological Regulations**

**Jelgava 2022**

## CONTENT

<b>Introduction .....</b>	<b>3</b>
<b>1. Selection of the topic of the Master's thesis.....</b>	<b>5</b>
1.1. Master's thesis topic sources .....	6
1.2. Master's thesis task.....	7
<b>2. Master's thesis development .....</b>	<b>8</b>
<b>3. Structure and content of the Master's thesis.....</b>	<b>9</b>
3.1. Structure of the thesis .....	9
3.2. Abstract.....	9
3.3. Introduction .....	9
3.3.1. The objective and tasks of the master's thesis .....	9
3.3.2. Overview of the bachelor's thesis .....	10
3.3.3. Definitions and designations .....	10
3.4. The main part.....	10
3.5. Summary.....	11
3.6. Conclusions and proposals .....	11
3.7. List of sources and literature .....	11
3.8. Appendices .....	11
3.9. Informative pages .....	11
3.9.1. Author's guarantee.....	11
3.9.2. Decision of the Master's Examination Commission .....	12
<b>4. Pre-defence of the Master's thesis .....</b>	<b>12</b>
<b>5. Preparation of Master's thesis .....</b>	<b>13</b>
<b>6. Submission of Master's thesis for defence .....</b>	<b>13</b>
<b>7. Review of Master's thesis .....</b>	<b>14</b>
<b>8. Defence of the Master's thesis.....</b>	<b>15</b>
Appendix. Abstract sample .....	17

## INTRODUCTION

The Methodological Regulations are intended as guidelines for the development of the master's thesis in the “Information Technology” study programme. The Regulations describe the main requirements for the development, evaluation, submission, review and defence of theses, as well as the structure of the master's thesis. In addition to these Methodological Regulations, issues related to final examinations are discussed in the LLU Study Regulations, LLU Regulations on Final Examinations, the rector's order Regarding the Verification of the Final Thesis in the Plagiarism Control System, the vice-rector's order on the Procedures for Submitting Electronic Copies of Final Theses and Their Verification in the Plagiarism Control System, in the rector's order On Violations of Academic Integrity in final works/doctoral theses, as well as in the Academic Integrity Regulations.

The Regulations can be used as auxiliary material for master's students, thesis supervisors and reviewers, so that there is a uniform approach to the preparation of final theses.

The Methodological Regulations describe the procedure for the performance of the following functional duties related to the development of master's theses:

Functional duties	Explanation
<i>Master's thesis consultant</i>	Due to the specificity of the topic, an employee of the relevant field is assigned to the student's work and provides professional consultations
<i>Master's thesis reviewer</i>	A faculty member or an IT employee approved by the dean's order, who familiarises himself/herself with the work developed and provides an objective assessment of it, points out the possibilities of its practical application, as well as shortcomings
<i>Master's thesis supervisor</i>	LBTU teaching staff or an IT company employee approved by the dean's order, who provides the student with methodical assistance during the development of thesis, advises on professional issues and guides the student's independent work
<i>Master's theses coordinator</i>	A faculty member/doctoral student or an employee of the department appointed by the head of the FIT Department of Computer Systems (hereinafter, DSK), who is responsible for organising the development of master's theses and coordinating the process
<i>DSK registrar</i>	Documentation specialist or registrar of the Department of Computer Systems (DSK) who receives, registers and processes printed and electronic documents related to the development of master's theses
<i>Director of the study programme</i>	Directors of the FIT engineering master's study programme “Information Technologies”
<i>MEC responsible secretary (hereinafter referred to as the “MEC secretary”)</i>	A FIT teaching staff member appointed by the order of the FIT dean who is responsible for coordinating the master's thesis development process, receiving final master's theses and organising the work of the Master's Examination Commission.

The calendar schedule for the development of master's theses (hereinafter referred to as the Schedule) is approved at the beginning of each study year. In order to describe the progress of the thesis development, the most important activities and main informative measures are listed in the table below (this material only shows the chronological order of the activities and the approximate time intervals, but during the work development it is mandatory to follow the approved Schedule):

Development of engineering master's theses

Activity	Time period
Approval of the master's thesis development schedule at DSK	September
Informing 2nd year master's students of FIT (initial information regarding the development of a master's thesis in electronic form)	September
Master's thesis topics and supervisor selection (negotiations)	September
Submitting the master thesis title and supervisor data to the master thesis coordinator (electronically in free form)	October
Submission of the task of the master's thesis to the coordinator (form in electronic format)	November
Coordination of the master's thesis task (forms in electronic format) with the head of the department, the director of the study programme	November
Approval of master's thesis tasks at DSK	November
<b>Version 1 of the draft</b> of the master's thesis (title page, introduction, table of contents, outline of section 1 of the theoretical or practical part (volume at least 12–15 pages), list of sources and literature). The draft is submitted in <b>electronic form in e-studies, in the course “<i>Master thesis</i>”</b> (InfT6004).	<b>January</b>
<b>Examination of the submitted drafts at DSK</b>	<b>January</b>
<b>Clarification of the task of the master's thesis</b>	<b>March–April</b>
Student application (registration) in DSK for pre-defence of theses	March
<b>Pre-defence of master's theses (presentation of the student's short report on the master's thesis and draft of the thesis in electronic form)</b>	<b>April</b> (no later than three weeks before the FT submission, in accordance with the Regulations on Final Examinations)
Recommendation of the department for the dean's decision on the admission of a master's thesis for defence (successful evaluation of the pre-defence of master's theses)	May
<b>Submission of a fully completed (bound) and signed master's thesis to the secretary of MEC</b>	<b>May</b>
Student application (registration) for defence with the MEC secretary	May
Receiving feedback from supervisors of master's theses	May
Review of master's theses	May
<b>Defence of master's theses</b>	<b>May – June</b>

The topic of the final master's thesis shall be chosen by the middle of the third semester.

Justified reasons are usually not applied to the delay in the deadline for submitting the master's thesis. In exceptional cases (prolonged illness, etc.), the deadline for submitting the thesis can be extended by the order of the dean. Therefore, the choice of the topic of the master's thesis, the coordination, development and presentation of initial data should be done in a timely manner, providing a certain period for unforeseen circumstances and complications.

During the development of master's theses, the actions performed at individual intermediate stages are approved by the decisions or orders of the DSK sessions or the FIT

dean. After this approval, changes can only be made with re-approval. The most important actions are as follows:

Activity	Time period	Type of documentation
Approval of the master's thesis topic application by DSK	November	An electronic form for the thesis topic application, an extract from the minutes of the DSK meeting attached to the DSK master's theses record file, which indicates the student's name, surname, title of the topic and supervisor
MEC technical secretariat approval	February	Proposals of the MEC secretary on the composition and duties of the technical secretariat submitted to the dean's office
DSK decision (proposal) on MEC work schedule (determination of defence days)	April	An extract from the minutes of the DSK meeting submitted to the dean's office, indicating the dates for the defence of master's theses
DSK's recommendation for approval of topics, supervisors and reviewers of master's theses	May	An extract from the minutes of the DSK meeting submitted to the dean's office, indicating the student's name, surname, title of the topic in Latvian and English, supervisor, consultant and reviewer
Dean's order on approval of the MEC work schedule	April–May (not later than one month before the commission's first meeting, in accordance with the Regulations on Final Examinations)	Dean's order indicating the dates and times for defence of master's theses
Dean's order on the approval of topics, supervisors and reviewers of master's theses	May	Dean's order indicating the student's name, surname, title of the topic in Latvian and English, supervisor, consultant and reviewer
Recommendation of the department on the readiness of the master's thesis to be defended (after the results of the pre-defence session of the department/institute)	At least 3 working days before the dean's order on admitting the student to defence	An extract from the minutes of the DSK meeting, which indicates the student's name, surname and title of the topic in Latvian, submitted to the Dean's Office
Dean's order on admitting a student to defence	No later than two weeks before the start of the commission's activity, in accordance with the Regulations on Final Examinations	Dean's order indicating the student's name, surname and matriculation number

## 1. SELECTION OF THE TOPIC OF THE MASTER'S THESIS

**The master's thesis** is an original academic research work in the field of information technology, developed using appropriate methods, containing a description of these methods, analysis of collected and compiled data, theoretical generalisations, independent scientific conclusions and recommendations made by the master's student.

## 1.1. Master's thesis topic sources

The topic of the master's thesis can be of a scientific (theoretical) or methodological nature, or of a practical orientation. The sources and types of selection of the topic can be different, but its selection shall take place at the initiative of the master's student.

When choosing a topic, it is recommended to consider the following:

- 1) a student shall choose a related field of the master's thesis topic;
- 2) a student shall clarify an existing problem (question) in this field, which for known reasons needs to be solved, which is of interest and can be the object of analysis and research;
- 3) a student shall determine what he/she could do in his/her thesis to solve the chosen problem or issue.

There are various options for choosing the topic of a master's theses:

- 1) the student can choose one of the topics for its bachelor's thesis offered by the relevant department. For this purpose, seminars are organised at the beginning of the semester, in which the lecturers of the departments talk about the existing scientific and practical topics, within the framework of which it is also possible to develop bachelor's theses;
- 2) the student itself can initiate the development of the topic of its interest according to the subject programme and conditions, in coordination with the teaching staff;
- 3) the master's student itself can initiate the development of the topic of its interest, which is related to the task to be performed at its current workplace. In such cases, a person who is from the relevant company and is well-versed in the researched topic may be attracted as a consultant during the development of the master's thesis. It is possible that the master's thesis supervisor is also an employee of this company, if his/her specialty and scientific degrees meet the requirements of the master's thesis supervisor;
- 4) a master's thesis can also be developed on the basis of a bachelor's thesis, supplementing and further expanding the topic discussed therein.

The selection of the topic takes place during several negotiations, and the teaching staff advises the master's student on the possible content of the work and the wording of the title. The teaching staff can reject the initial topic developed by the master's student if, due to various circumstances, the successful preparation of the thesis is not possible. The teaching staff justifies their opinion, and by mutual agreement with the master's student, another topic is chosen.

The title of the master's thesis should be formulated briefly and according to the content of the thesis. It is preferable to include the words "problems" or "methods" in the topic of the master's thesis. The topic shall reflect the intended contribution of the master's student, it cannot be too general and comprehensive. For example, the wording "... methods to be used" does not indicate what and why these methods will be used, but the number of known methods can be very large. Definition is given by such formulations as, for example, "... comparison and evaluation of the methods to be used", "... selection of a method for solving the XXX task", etc.

The use of abbreviations and acronyms should be avoided in the wording of the topic, as well as excessively long wording (the title should fit in no more than three lines on the title page).

Before approving the topics of the master's theses, the wording of the submitted topics and compliance with the requirements of the master's thesis are evaluated, and it is also ensured that several master's theses do not have identical topics.

When choosing a master's thesis supervisor, it is necessary to take into account the compliance of his/her professional qualifications with the requirements set for supervisors of theses related to the IT field. The master's thesis may be supervised by a teaching staff member with a doctorate degree (in the relevant field/sub-field), in exceptional cases, a teaching staff member with a master's degree (in the relevant field/sub-field) with long-term experience in pedagogical and scientific work, as well as doctoral students of the relevant field/sub-field who have passed the theoretical part.

The compliance of each specific supervisor with these requirements is evaluated by the department.

The duties of the supervisor include:

- preparation of the tasks of the thesis together with the master's student;
- recommending sources of information and literature;
- regular counselling and monitoring of thesis development;
- informing the profiling department if the supervisor is convinced that the work will not be prepared on time;
- preparation of feedback on the development of the master's thesis..

The supervisor can also participate in the MEC meeting, where the thesis in question is defended.

It is also possible to attract a consultant to the work, and this is especially desirable in cases where an interdisciplinary master's thesis topic is chosen.

NOTE! In order for the selection of the topic, coordination and the entire further development of the bachelor's thesis to take place promptly and in accordance with the requirements, all students shall provide the coordinator of the bachelor's thesis with their e-mail address and check this contact address regularly.

## **1.2. Master's thesis task**

During the selection of the topic, the potential content of the thesis is also discussed, which should be briefly described in the "Objective and tasks of the master's thesis" in the master's thesis form. The form can be obtained in electronic format on the faculty's website in the Studies/Bachelor's and master's thesis development section.

All required fields shall be filled in and the form shall be submitted in electronic format (by e-mailing a completed form in the form of a document or by filling out an electronic form) to the coordinator of master's theses within the specified deadline.

If any comments or requested changes are received during the coordination of the topic, the master's theses coordinator informs the student about it, indicating the deadline for fulfilling the requirements. This specified deadline shall be observed when submitting (sending by e-mail) the corrected master's thesis in electronic format to the master thesis coordinator.

Master theses topics are recommended for approval by the decision of the department meeting, about which students are informed within 5 working days (the topics are approved by the dean's order).

NOTE! The topic of the master's thesis, supervisor and reviewers are approved by the order of the dean, which is prepared on the basis of the decision of the department meeting. The title of the developed master's thesis shall be the same as in the order. Changing or correcting the approved thesis topic, even if one word is changed in the title, is possible only in exceptional cases, following the previous approval procedure (special attention should be paid to the need to correct the title of the topic in the spring, during the pre-defence of master's theses).

NOTE! If the student has applied for the topic in the previous year of study, but for objective reasons has not defended it and is on academic leave, the topic, the submission of the master's thesis and the entire further process of developing the master's thesis shall be repeated.

## **2. MASTER'S THESIS DEVELOPMENT**

The master's thesis is a research work in the field of information technology, in which the master's student has performed an analysis of a certain problem, made independent scientific conclusions and demonstrated an original orientation.

The research work consists of an in-depth analysis of the selected topic or defined problem, analysis and comparison of known and selected methods, as a result, determining the best solution (method) for a specific problem and/or the application of one's own developed method, as well as the justification of its practical validity on the basis of the obtained results.

The development of the master's thesis begins with the research of the field to which the chosen topic of the thesis applies. For this purpose, literature sources recommended by the supervisor and found by the master's thesis author are used. The analysis of literature and other theoretical materials shall be carried out according to the research or methodological direction of the work, as well as the tasks of the master's thesis. As a result of the analysis, known and recognised methods can be selected, which are actually used for the solution of the defined problem (i.e., the use of existing methods has been implemented according to specific requirements). During the selection of methods, they should be analysed and compared, so that the most suitable method for solving a specific problem can be chosen based on the obtained results, or the positive and negative features of each method can be determined.

In case there are no known methods for the solution of the problem, it is necessary to develop one's own method or approach, or to modify the existing methods.

On the basis of the decisions made during the analysis and the developed solutions, the measures provided for in the tasks should be implemented in order to ensure the achievement of the stated objective of the master's thesis. During the development of the thesis, it is shown how it is implemented, and at the end it is proved how the set objective has been achieved (theoretically, statistically, by means of measurements or otherwise). In the case of methodological work, user surveys or some other justification method can also be used.

During the development of the entire master's thesis, the master's student regularly consults with the supervisor and consultant, if there is one, and follows the instructions given by the supervisor.



### **3. STRUCTURE AND CONTENT OF THE MASTER'S THESIS**

The formal requirements of the work structure and the arrangement of the details are described in separate Methodological regulations on structure of term papers, bachelor's theses and master's theses, and this document only deals with the structural parts of the bachelor's thesis that relate to its content. The thesis shall be written in a literary language, using the style of applied writing and scientific language and the professional terminology of the field.

#### **3.1. Structure of the thesis**

The master's thesis shall include the following sections:

- 1) first pages (title page, abstract, table of contents);
- 2) introduction (objective and tasks of the work, overview of the work, definitions and abbreviations);
- 3) main part of the work (theoretical part, description of the solution, practical application);
- 4) summary
- 5) conclusions and proposals;
- 6) literature (list of used literature and other sources of information);
- 7) appendices;
- 8) informative pages (author's guarantee, evaluation page).

#### **3.2. Abstract**

The abstract is a short and precise reflection of the work, which does not exceed one page. The abstract shall be created according to the sample that is added in library catalogues – it should include two types of information:

- 1) formal description of the work – author of the work, title of the work, brief description of the scope of the work: city, year, number of pages (up to the appendices), tables, figures, information sources and appendices;
- 2) a brief description of the content of the work, emphasising the author's research. This description should not duplicate the task of the master's thesis. After reading the abstract, the what, why and how described in the master's thesis should be clear.

References to specific sections of the work and used literature sources are not used in the abstract.

The abstract shall be written in two languages (each on a separate page): Latvian and English. A sample of the abstract is given in the appendix, as well as in the sample of the master thesis, which can be downloaded in electronic form on the faculty's website in the section Studies/Bachelor's and master's thesis development.

#### **3.3. Introduction**

The task of the introduction is to provide an idea of the master's thesis. The introduction is a separate section without sub-sections, but contains certain types of information.

##### **3.3.1. The objective and tasks of the master's thesis**

In this section, the scope and relevance of the topic of the bachelor's thesis should be described, the objective and the tasks set for its achievement should be precisely formulated. The research orientation of the work should be briefly described. The description should not be long, no more than 2 pages.

### 3.3.2. Overview of the bachelor's thesis

This section provides an overview of the work's content (excluding the first pages). Indicates how many sections the thesis description consists of and briefly explains the content of each section (characterises what kind of information is given in the respective section, but the explanation should not duplicate the title of the section).

### 3.3.3. Definitions and designations

If the bachelor thesis uses abbreviations and concepts that are not clearly understood, they shall be explained. The most important concepts used in the bachelor's thesis and their definitions are usually presented in the form of a table (the table does not need to be numbered), with the entries arranged in alphabetical order.

The symbolic designations or acronyms used in the work and their explanations are arranged in a separate table in alphabetical order. If there are no such designations in the work, or if only generally accepted designations are used in their traditional meaning (for example, IT – information technology), then this section may be omitted.

## 3.4. The main part

The main part of the master's thesis shall be logically structured. A student shall make references to the used sources of information, design tables, figures and other elements in accordance with the requirements of the Methodological Regulations.

The discussion of the topic is usually divided into three blocks.

In the first block, it is desirable to describe the current state of the problem and the known experience in solving it. Here, the author demonstrates his/her ability to select and review literature and other materials, as well as draw conclusions. It should be taken into account that the existing state of the problem, techniques and methodology should not be considered in general, but in a specific context that corresponds to the objectives and tasks of the thesis.

Unlike the analytical part prepared during the development of bachelor's theses, **the theoretical part of the master's thesis should reflect a scientific approach to the analysis of the problem as much as possible.** It should provide the theoretical basis for the research carried out in the thesis. For example, if several pieces of software are considered, then the comparison should be made not only according to technical or functional parameters, but also their capabilities in solving a specific problem (or task) should be evaluated.

The second block shall describe the solutions proposed by the author and their justification.

The third block shall describe how these solutions were implemented and what results were obtained.

The volume of the main part of the master's thesis is **recommended to be between 50 and 80 pages**, and the first block shall not exceed the total volume of the second and third blocks. The pages starting with the introduction and ending with the list of sources and literature are counted in the volume of the main part.

**NOTE! The volume of the main part of the bachelor's thesis shall reach at least the minimum specified limit.** Too little volume of the main part of the bachelor's thesis may be the reason for not allowing the thesis to be defended.

If the work is dedicated to the development of specific software, the purpose of developing this programme should be described in sufficient detail and the existing software tools and methods for solving similar problems should be evaluated (for example, what business

processes the software is intended to implement). The amount of programmable units, the relationship of the specific development to a certain stage of the life cycle, as well as the description of the life cycle of the specific software development should be indicated.

If the work is related to methodological development (for example, the preparation of a course), then the analytical part is especially important, which should reflect the principles of selection of information included in the course, as well as show the place of the specific subject in the study programme and its relationship with other subjects.

### **3.5. Summary**

The results of the work (what exactly has been researched, developed, implemented, etc.) should be described within the framework of one page. In this section, information can also be provided if, in connection with the topic of the thesis, its author has participated in a project (indicating name of the project, place, position held), Latvian or international scientific conference (indicating name, place, time), or has prepared a scientific article and whether this scientific article is accepted for publication (indicating the author(s) of the article, title, edition, number of pages).

### **3.6. Conclusions and proposals**

Conclusions and proposals should be written in the form of theses, guided by the objective and tasks of the formulated work and based on the results obtained in the work.

The conclusions are based only on the materials presented in the sections. They should be specific, provide answers to the tasks set, and show their creative contribution. As far as possible, the fact of whether the defined tasks have been fulfilled and whether it will be possible to achieve the set objective should be reflected on. Conclusions should reflect the knowledge gained by the author of the work, and not generally known things read in literary sources.

In the proposals, the author should show the ways of solving a certain problem, resulting from the summary of the research.

### **3.7. List of sources and literature**

The list of sources and literature is drawn up according to the Methodological Regulations. The total number of sources is not less than 15 and it is recommended that the number of internet resources does not exceed 1/3 of the total number.

### **3.8. Appendices**

Various auxiliary materials that are not included in the main content of the work are added to the work as appendices. If the appendices exceed 100 pages, they can be attached electronically.

### **3.9. Informative pages**

In the final part of the work, pages containing formal information about the work shall be added.

#### **3.9.1. Author's guarantee**

This page contains a statement signed by the student that the work is personally designed and not plagiarised. A sample of the author's guarantee is provided in the bachelor's thesis draft, which is available electronically on the faculty's website in the Studies/Bachelor's and master's thesis development section.

### 3.9.2. Decision of the Master's Examination Commission

Instead of the decision of the Master's Examination Commission, a blank form is inserted during the preparation of the master's thesis, which is filled in after the defence of the master's thesis. A sample is provided in the master's thesis draft, which is available electronically on the faculty's website in the Studies/Bachelor's and master's thesis development section.

## 4. PRE-DEFENCE OF THE MASTER'S THESIS

An important control moment in the development of master's theses is the pre-defence of the master's theses, which takes place in the middle of the spring semester. The results of examination and pre-defence of master's theses are summarised in the department's decision on the approval of recommendations regarding the topic, supervisor and reviewers of the master's thesis, which is submitted to the FIT dean's office.

1. The pre-defence of the master's thesis takes place in the middle of the spring semester (usually in April, the dates are precisely determined in the Schedule for the development of master's theses for the current academic year), and it takes place in a face-to-face meeting, preferably in the presence of at least 3 faculty members.
2. Before the pre-defence of the thesis, the master's student shall sign up for the examination of the works at the DSK according to the approved schedule.
3. During the pre-defence, the master's student shall **present a draft of the master's thesis** in electronic form and present the master's thesis to be developed.
4. The master's student presents (10 min.) the research carried out in his/her work:
  - 4.1. introduces himself/herself, the topic of the work and the supervisor to those present,
  - 4.2. formulates the set objective and the tasks (WHAT needs to be done to achieve the objective?),
  - 4.3. justifies the choice of the specific solution (HOW can it be done?),
  - 4.4. talks about the work done (WHAT was done?)
  - 4.5. presents conclusions and proposals, emphasising the author's developments,
  - 4.6. provides his/her assessment of the degree of work readiness.
5. After the report, the teaching staff and those present ask questions about the content of the thesis, and the master's student shall answer them briefly and accurately.
6. Every day, after the pre-defence of all theses, a decision is made about the degree of readiness of the thesis and the possibility to participate in the defence of the final theses.
7. If the pre-defence has been unsuccessful, a decision is made at the DSK meeting not to recommend the author of the work to be included in the order on the admission of the work for defence. In exceptional cases, the thesis may be referred for a repeated pre-defence after making appropriate improvements, according to the remarks, recommendations and reprimands made at the meeting.

After a successful pre-defence, following the suggestions and reprimands expressed at the DSK meeting, the student improves the master's thesis and submits it to the secretary of MEC within the deadline specified in the schedule for developing the master's thesis.

## 5. PREPARATION OF MASTER'S THESIS

The master's thesis can be prepared in 1 or 2 copies, one of them shall be bound in hardcover, the other can be spiral-bound (if the student wishes, both copies can be bound in hardcover). The second copy is returned to the student after defending the thesis.

The electronic version of the thesis shall be uploaded to LBTU IS using the student's user account and password. In addition, the abstract of the final thesis (FT) shall be copied or written in Latvian and English in the input fields of LBTU IS. The electronic version of the thesis shall be uploaded to the system before the submission of the printed version of the thesis. It is possible to re-upload the FT file before the submission of the printed copies. To ensure bibliographic description and classification of master's theses in the ALEPH information system, the permissible length of each abstract of a master's thesis (including spaces) is limited to 850 characters.

The master's thesis file uploaded to LBTU IS shall meet the following requirements:

- all parts of the work (title page, introduction, main text, figures, tables, appendices, list of sources and literature, table of contents, etc.) shall be contained in one file;
- file format – PDF (*Portable Document Format*), size up to 50 MB;
- files converted from MS Word .doc (.docx) format to PDF shall not display watermarks and ad texts of conversion programmes;
- the file shall not be a scanned text image;
- the file shall not be password protected (locked);
- the file name shall use letters of the Latin alphabet and shall not contain diacritic marks (softening marks, lengthening marks, etc.);
- the name of the file shall contain the student's surname, first name and matriculation number, e.g., "Ozolins\_Janis\_LI13094.pdf";
- in the file settings ("File/Properties"), the work name (Title) and author (Author) shall be specified.

## 6. SUBMISSION OF MASTER'S THESIS FOR DEFENCE

A master's student can submit a successfully pre-defended and improved master's thesis in one of the following ways.

- A printed and bound master's thesis with the author's and supervisor's signatures on the title page of the thesis shall be submitted to the secretary of the MEC commission or to a person appointed by the faculty within the deadline specified in the master's thesis development schedule, but no later than 10 working days before the first session of the commission's work. The title page of the thesis is also signed by the consultant(s), if it has been officially approved.
- The master's thesis is submitted electronically signed with a secure electronic signature. The work shall be electronically signed by everyone whose signatures have to be on the title page of the thesis, e.g., the supervisor, consultant, head of the department, etc..

A student shall upload the electronic file in accordance with the order of the vice-rector for studies "On the Procedure for Submitting Electronic Copies of Final Theses and their Verification in the Plagiarism Control System" to the LLU Information System (LLU IS) using their LLU IS user account.

All submitted FTs are verified in the integrated plagiarism control system. If signs of plagiarism are detected, the faculty shall take measures in accordance with the rector's order "On Violations of Academic Integrity in Final Theses/Doctoral Theses".

The feedback from the master's thesis supervisor shall be submitted to the secretary of MEC no later than the deadline specified in the thesis development schedule.

**NOTE!** The master's student shall inform the MEC secretary in a timely manner and submit or electronically send his/her supervisor's contact information if the student's supervisor is not a FIT faculty member. The MEC secretary electronically sends the reference form to the supervisor, as well as information about the deadline and procedure for submitting the feedback.

A form is provided for the supervisor's feedback, the template of which is available electronically on the faculty's website in the Studies/Bachelor's and master's theses development section.

After submission of theses, a decision is made at the DSK meeting on recommending the master's thesis for defence (basic rules – successful pre-defence).

A master's thesis may not be recommended for defence at the MEC if the thesis has not been presented in the pre-defence, the scope of the thesis is inadequate, the chosen methodology is incorrect, the thesis is not properly structured, the prescribed submission procedure has not been followed or there are other similar violations.

**NOTE!** Students shall find out in time whether there are any previous tuition debts. Determining and monitoring these debts is under the responsibility of the Dean's Office, therefore it may happen that a student whose work has been deemed ready for defence by the department is not allowed to defend the thesis. **All types of debts shall be settled no later than a day before the FIT dean's order on admitting a student to defence.**

After the formal examination of the submitted work, the secretary of the MEC sends an e-mail to the reviewers of the work with instructions on the procedure for preparing and submitting the review. The reviewer sends his/her evaluation without an evaluation mark to the secretary of MEC. The secretary of MEC sends this evaluation electronically to the author of the work. In printed form, the reviewers and supervisors submit forms with work evaluation and printed versions of reviewed works to the secretary of MEC within the deadline specified in the schedule. The draft review form is available electronically on the faculty's website in the Studies/Bachelor's and master's thesis development section.

Based on the recommendation of the department and the student's performance (debt) information from the dean's office, the dean of FIT issues an order on the admission of master's theses for defence (not later than two weeks before the start of the commission's activity, in accordance with the Regulations on Final Examinations).

The calendar schedule for the defence of master's theses, indicating the order of the applicants' presentations, is drawn up by DSK. The schedule shall be openly published at least 2 days before the start of the work of MEC. Usually, the schedule is published in a shared directory using a cloud-based file storage and synchronisation service, and remote access to this directory is provided for students, supervisors, MEC committee members and reviewers.

## **7. REVIEW OF MASTER'S THESIS**

Reviewers of master's theses are appointed by DSK. Two reviewers are appointed for each master's thesis.

The reviewers of the master's thesis can be qualified doctoral degree holders and doctoral degree holders of the Republic of Latvia, as well as specialists in the relevant field with a doctor's or master's degree or doctoral students.

The reviewer, who is a teaching staff member of LBTU, is provided with access to the master thesis in the LAIS system no later than 10 days before the defence of the thesis. For reviewers who are not LBTU teaching staff, the work is usually sent electronically to the e-mail by the secretary of MEC with instructions on the procedure for preparing and submitting the review. When sending an e-mail, the reviewer is also notified of the required review submission deadline. The draft review form is available electronically on the faculty's website in the Studies/Bachelor's and master's thesis development section.

## **8. DEFENCE OF THE MASTER'S THESIS**

After the review of the theses, public defence of the master's theses takes place within previously determined and announced deadlines. MEC meetings are open.

The procedure for defending the master's thesis at the MEC meeting is as follows:

- presentation of the work given by the author of the thesis (20 min.):
  - the topic of the master's thesis and the objectives set in the thesis,
  - the tasks set to achieve the objectives,
  - description of the existing situation at the time of developing the thesis,
  - the chosen solutions and their justification,
  - results,
  - conclusions and proposals;
- questions asked by MEC members and those present and the author's answers;
- reading the supervisor's written feedback;
- reading the written feedback of the reviewers;
- final words of the author of the thesis (up to 5 min.). The author can respond to the reviewer's criticisms, as well as to previously unanswered, incomplete or incorrectly answered questions.

**NOTE!** The master's student may disagree with the reviewer's reprimands, but then he/she shall prove his/her point of view with practical and work-based arguments.

For the purpose of the report, the master's student shall prepare a presentation of his/her work, which will be demonstrated using a multimedia projector. Therefore, it is necessary to inform DSK in time and agree on the necessary and possible hardware and software to be used during the presentation. In some cases, handouts for the commission can be prepared.

Since the reviewer's and supervisor's assessment is only part of the information that forms the summative assessment, neither the supervisor's nor the reviewer's recommended grade is mentioned during the session, but it is stated whether the work corresponds to the academic master's degree to be awarded.

Every day, after the defence of all theses, a closed session is held, during which the commission performs the final evaluation of the defended works, taking into account the opinion of the reviewers, the supervisor's feedback and the master's student's ability to defend his/her work, as well as the knowledge demonstrated during the defence.

The following considerations are taken into account during the evaluation of the master's thesis:

- correspondence of the main parts and results of the master's thesis to the defined topic of the thesis;
- the scope and complexity of the work (e.g. meets or exceeds curriculum requirements);
- thesis description quality;
- the quality of the research performed. The master's thesis shall be based on research. The research consists of an in-depth analysis of the selected topic or defined problem, analysis and comparison of known and selected methods, as a result, determining the best solution (method) for a specific problem and/or the application of one's own developed method, as well as the justification of its practical validity on the basis of the obtained results.
- the presentation of the thesis, during which the master's student demonstrated an understanding of the topic and logically justified the results achieved;
- the structure of the thesis (compliance with Methodological Regulations).

An outstanding master's thesis is a thesis that, in terms of scope (in terms of content) or complexity, significantly exceeds the requirements of the curriculum. In the case of a master's thesis of a theoretical nature, the results of the research could have been published in a scientific journal or conference with closed international peer review (or one that could be published). In the case of a master's thesis of a technological nature, it could be based on implemented (or to be implemented) software or an information system developed by the author independently or by leading a project group.

MEC recommends submitting the best master's theses to competitions in the field of IT.

Defence results are evaluated based on the ten-point system. If the evaluation is lower than four points, the commission makes an additional decision, in which it is indicated whether the author of the thesis has the right to defend an improved thesis again or whether it is necessary to choose a new topic. The student has the right to re-submit the work for defence within three years after passing the theoretical course.

The assessment of the master's thesis, including unsatisfactory assessment, is recorded in the MEC meeting minutes book, on the decision page of the Master's Examination Commission attached to the master's thesis and registered in the student's register of achievements.



## ABSTRACT

**Bērziņš J.** Development of a new image segmentation method: bachelor's thesis. Jelgava: LBTU, 2017. 78 pages, 10 figures, 3 tables, 15 sources of information, 3 appendices.

The bachelor's thesis examines several existing algorithms of image segmentation methods and the shortcomings of these methods. In addition, various image enhancement techniques are described, which can be used to increase the quality of the image segmentation result.

For the purposes of developing a new segmentation method, several algorithms are offered, including segmentation algorithms independently developed by the author and image enhancement techniques. A programme has been created for the study of algorithms, which allows comparing the proposed methods, and an analysis of these algorithms has been carried out.

A new image segmentation method has been developed during the work, which uses both image enhancement techniques and developed algorithms. A programme has been developed for studying and evaluating the operation of the new method, which significantly facilitates this process.