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

**PREPARATION OF COURSE WORK,  
BACHELOR'S THESIS AND MASTER'S THESIS**

**Methodological Regulations**

**Jelgava 2022**

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## INTRODUCTION

The Methodological Regulations are intended for students and lecturers of the LBTU IT Faculty as informative material regarding the preparation of term papers, bachelor's theses and master's theses. The Regulations describe only the formal structure requirements, but not matters relating to the content of the works.

### 1. GENERAL STRUCTURE

Term papers, bachelor's theses and master's theses are usually prepared according to the following structure:

- 1) first pages (title page, abstracts, 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).

NOTE! Term papers may not have a "Definitions and abbreviations" section, as well as abstracts; informative pages are added only to bachelor's and master's theses.

### 2. FIRST PAGES

#### 2.1. Title page

The first page of the work is the title page. Depending on the specific type of work, the title page shall include the following details:

- 1) name of the educational institution (Latvia University of Life Sciences and Technologies);
- 2) name of the faculty (Faculty of Information Technologies);
- 3) name of the department (for example, the Department of Computer Systems);
- 4) name and surname of the student;
- 5) title of the work;
- 6) type of work, for example:
  - term paper on the subject "WWW technologies",
  - bachelor's thesis for obtaining a professional bachelor's degree in information technology,
  - bachelor's thesis for obtaining an engineering bachelor's degree in computer control and computer science,
  - master's thesis for obtaining an engineering master's degree in information technology;
- 7) supervisor (space for signature and date, scientific degree, position, first name and last name);
- 8) consultant, if one is assigned to the work (place for signature and date, scientific degree, position, first name and last name);

- 9) author (space for signature and date, matriculation number, first name and last name);
- 10) place and year (for example, Jelgava 2022).

Samples of title pages for term papers, bachelor's and master's theses are given in the appendices.

## 2.2. Abstract

The abstract should be written in two languages – Latvian and English. The abstract is 1 page long in each language on a separate page. Above the abstract there is an unnumbered heading “ANOTĀCIJA”, in English – “ABSTRACT”.

The abstract shall be created according to the abstract sample in library catalogues – it should contain 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 (main parts, i.e. up to the appendices), tables, figures, information sources and appendices, for example:

**Bērziņš J. Development and implementation of software design for the EKSPLO project: bachelor's thesis. Jelgava: LBTU, 2012. 72 pages, 10 figures, 3 tables, 15 sources of information, 3 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 bachelor's thesis. After reading the abstract, the what, why and how described in the bachelor's thesis should be clear.

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

An abstract sample in Latvian is given in the Methodological Regulations for the development of bachelor's and master's theses.

## 2.3. Table of contents

The table of contents is created for works whose main part is not less than 8 pages. It is created by using automatic table of contents capabilities. The table of contents lists the headings of all sections and sub-sections and indicates their first page numbers. Above the table of contents is an unnumbered heading “TABLE OF CONTENTS”.

Sections and sub-sections of the main part shall be numbered in Arabic numerals. The sub-section number consists of the section number and the sub-section sequence number separated by a period. The headings of sections and sub-sections and the numbering of pages in the table of contents shall match the headings of sections and sub-sections and the numbering of pages specified in the work. It is not desirable to use more than 4 levels of sections (headings) in works, it is recommended to include 3 levels in the table of contents. The table of contents also includes a list of appendices.

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.

Lists of tables and figures containing the numbers, names and page numbers of these objects can also be added after the table of contents.

### **3. STRUCTURE OF THE TEXT AND VARIOUS OBJECTS**

#### **3.1. Page dimensions**

Theses shall be written on white sheets of A4 format on one side.

Pages should have the following non-printable margins:

- 30 mm from the left side;
- 20 mm from the right side;
- 25 mm from above;
- 25 mm from the bottom.

#### **3.2. Page numbering**

Page numbers are not indicated on the first pages of the theses (title page, abstracts and table of contents), but are included in the total numbering. The main part of the theses begins with an introduction. The pages are numbered in Arabic numerals. Appendices are numbered consecutively in the same way as the main text.

Page numbers shall be placed at the bottom of the page (*footer*) in the centre or on the right side. Character font shall be the same as in the main text, size – 12 points.

#### **3.3. Structure of the main text**

The main text shall be written using the *Times New Roman* font, font size 12 points, line spacing – 1.5 lines. Paragraphs shall be justified on both sides. The first line of paragraphs is indented by 1 cm using formatting commands (it is not allowed to use the tab or space key, which would make it difficult to create structured text).

Another type of main text paragraph formatting is also allowed, in which the first line of the paragraph is not indented, but the paragraph is separated from the next paragraph by a 6 pt space. Throughout the work, a student shall adhere to a single paragraph structure.

If the text includes the programme code of a programming language, then the *Courier New* font should be used for it.

When writing software documentation and other technical documents, a student shall mostly use simple extended sentences and avoid long monolithic text. The function “Text structuring” shall be used where appropriate.

A numbered list or bulleted list shall be used to create structured text. The recommended designation of list items are as follows: a number in parentheses, a letter in parentheses, a bullet. It is recommended not to use paragraphs marked with the symbol on several levels to structure the text (it should be noted that it is not possible to refer to such text). It is not allowed to use the same symbol on several levels.

Bold, italics, underlining, etc. should be used to highlight certain elements of the text, only such highlights should be used consistently throughout the text, i.e. the same type of highlighting should be used for the same type of information, for example, to highlight words in Latin, italics are used.

The main text shall be spell-checked before submission of the finished work. Due to low language skills, the work may not be accepted for defence.

### 3.4. Headings

Headings of sections (first level headings) are centred, written in capital letters (*all caps*). The headings of all other levels are aligned to the left side (*align left*). Do not put a period at the end of the headings and do not underline them.

Headings are numbered in Arabic numerals, followed by a period. The exception: abstract, introduction, conclusions and list of sources and literature sections, as well as the “Appendices” page are not numbered. Numbering of sub-sections should be done in such a way that it reflects the numbers of higher levels. For example, the number 1.2.5 is assigned to the fifth section of the second sub-section of the first section (this numbering is created by using *Heading* or self-defined styles).

The use of acronyms in headings should be avoided, especially if they are not commonly used. The use of auxiliary sentences and punctuation marks is also not desirable in the headings.

Although the headings “Table of Contents” and “Abstract” should be formatted in the same way as the headings of other sections, they should not be included in the table of contents.

Each section (first level heading) should start on a new page.

Sub-sections do not need to start on a new page, but a single page should contain a heading and at least two lines of sub-section text.

For headings, the font size should be chosen in such a way as to improve the readability of the text. The same applies to the use of the *bold* function. For example, the character size can be 14 to 20 points, the line spacing is 1 line, the characters are in bold.

There should be single line spacing between headings and subheadings, as well as between subheadings and text (since the font size of the main text is 12 pt, this interval is also 12 pt). Between the heading and the text (if not followed by a sub-heading), an interval of two lines (i.e., 24 pt) should be used.

NOTE! Both a period and a comma can be used as a decimal sign for numbers, but it shall be the same throughout the theses.

### 3.5. References to the used sources of information

Reference to the used sources of information should be made in such a way that it is unequivocally clear to the reader to what extent the work or idea of another author has been used. A reference allows identification of the source from which an idea or quote is taken, and to determine its location within that source.

The reference in the text to the used information source should be placed according to the standard adopted by [IEEE](http://www.ieee.org/documents/ieeecitationref.pdf) (<http://www.ieee.org/documents/ieeecitationref.pdf>) – in square brackets with a serial number that corresponds to the serial number of ordered list of sources and literature.

References are usually used in the following cases:

- in free form text describing the development process, which is based on other authors' original ideas, conclusions, mentioned facts, etc., for example, **Based on the basic principles of the described algorithm [3], the following modifications are recommended for the requirements of the considered system: ...;**
- if a direct quote is used in the text, it is put in quotation marks, for example **Lavrov [1] gave a definition of focused testing in his work: “Testing is the process of executing a programme with the aim of finding errors”**. In the reference to the

quotation, it is desirable to indicate the page number from which the quotation is taken;

- when figures, formulas or tables are taken from a specific literature source, for example, **The software life cycle waterfall model is reflected in the figure below (see Fig. 1).**

No reference is necessary for common ideas or expressions whose author is unknown and which may be considered common property.

References to other sections of the same work are given in round brackets. The abbreviation (for example, **sk.** in the Latvian language) can also be used in the reference, but then it shall be used in all references throughout the text, for example ... **detalizēts apraksts dots (3.1) ...** or **Formulas izmantošana detalizēti aprakstīta pie analīzes algoritma (sk. 3.1).**

### 3.6. Units of measurement

SI system physical units and their derivatives and designations shall be used in the work. Abbreviated designations for units of measurement are used after the numerical values of the size, in the table column headings and in the explanations to the formulas. In the text, the designations of the units of measurement are written on the same line as the numerical values of the size. In abbreviated designations, a full stop is not used as an abbreviation. The designations of all composite units shall be written on the same line, using a negative notation, for example:  $\text{ms}^{-1}$ ,  $\text{kg m}^{-2}$ .

### 3.7. Formula text

The formula text should be placed in a separate line in the centre. Use *MS Equation* or another formula preparation programme. The formulas are numbered in Arabic numerals within the sections or continuously throughout the work. Formula numbers are written in parentheses opposite the formula on the right side of the page. To place the formulas in the centre and the number on the right side, it is convenient to use tabulation marks. The units of measurement are written after the numerical values of the size and in formula explanations. Formula explanations shall be written below the formula, each in its own line. A comma is placed between the explanation and the unit of measurement, a semicolon is placed after the unit of measurement, and a period is placed after the unit of measurement of the last explanation.

*An example of a formula*

$$E_k = \frac{mv^2}{2}, \quad (1)$$

where,  $E_k$  – kinetic energy, J;

$m$  – mass, kg;

$v$  – speed,  $\text{m s}^{-1}$ .

In the text, when referring to one of the formulas, its number is written in round brackets, for example ... **calculated by formula (1).**

### 3.8. Tables

Each table shall have a name and a number. The tables are numbered in Arabic numerals within the sections or continuously throughout the work. There should be single line spacing between the preceding text and the table number and name, as well as after the table. The number and name of the table are placed above the table in the centre and in one line, and there is no period at the end. The table name should be highlighted in bold. The name should be short and specific and reflect the main content of the table. The name of the table should not be a copy of the heading of the corresponding section.

If a student has used tables only as a text structuring element that is clearly visible, the tables may not be numbered. In this case, the table is also not given a name.

The width of the table should not exceed the limits of the main text. The table can be continued on the following pages. The table head shall be repeated on each page. A student can also indicate the number of the table (without a name) on each page of the continuation of the table with the indication "... continuation of table" or "... end of table".

It should be ensured that, in addition to the table heading, there are also at least two rows of its content on the page. The table number and name should be on the same page as the table.

Unless it contradicts the content of the table, the column "No." is inserted as the first column in tables. Table values are usually centred (centre the rows of the table heading). If the tables contain voluminous text, the paragraphs shall be aligned to the left in the corresponding columns. Single line spacing is used throughout the text of the table. Table column or row names are not abbreviated, but may be moved to a new line or rotated. In columns, the first words are capitalised, unless an obvious subordinate text structure is used.

In columns, the rows of numbers shall be on the same vertical. Numbers of equal meaning shall have the same precision (the same number of digits after the decimal point) at least within each column. If the same number or text is repeated in a downward column, no quotation marks should be placed, but the number or text should be repeated. It is not recommended to leave blank cells in the table. If a phenomenon has not been observed, put in the cell a selected designation or a short explanatory text (for example, "not observed").

If all indicators placed in the table have the same unit of measurement, then the abbreviated designation of the unit of measurement can be mentioned at the end of the table name after a comma or given in the relevant text. In other cases, the units of measurement should be indicated in the column or row headings of the table.

A student shall use the same font and size of characters in the tables as in the main text. Large tables can use 1 pt smaller character size. The character size shall be the same throughout the table.

All tables inserted in the thesis shall be referenced in the text.

*An example of a table structure*

**Table 1. Dynamics of types of internet connections in Latvian companies, %**

Year	Connection type				
	Wireless connection	Dial-up access	ISDN	xDSL	Other
2004	4.9	17.4	25.7	29.1	22.9
2005	5.2	12.2	22.2	30.4	30.0
2006	7.4	10.0	14.6	35.2	32.8

When inserting a table that is not created by the author, the source of the information used shall be cited.

*An example of a table structure*

**Table 1. Dynamics of types of internet connections in Latvian companies, % [10]**

Year	Connection type				
	Wireless connection	Dial-up access	ISDN	xDSL	Other



2004	4.9	17.4	25.7	29.1	22.9
2005	5.2	12.2	22.2	30.4	30.0
2006	7.4	10.0	14.6	35.2	32.8

### 3.9. Figures

All illustrations (sketches, drawings, schemes, diagrams, photos, etc.) used in the work have a common name – figures. Illustrative material placed as figures should complement the text, facilitate its understanding and facilitate the perception of the material presented in the work. At the same time, figures should not duplicate the information contained in the tables. All figures included in the thesis shall be referenced in the text.

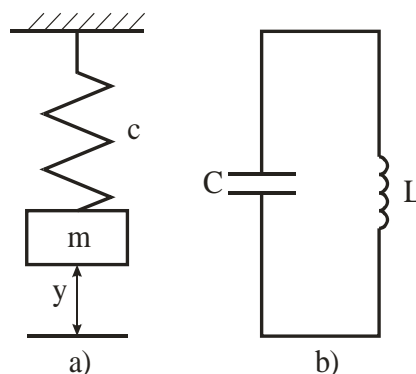
The serial number of the figure and its name are placed below the figure, in the centre. The figures are numbered in Arabic numerals by sections or continuously throughout the work. **The name of the figure is written in English** using the same font and size as in the main text, but in bold. Between the text and the figure, as well as after the figure name and explanations, there should be single line spacing. Figure names should be concise and reflect the essence of the information contained in the figure.

**The explanatory part of the figure (in English)** can be included in the figure, given after the name of the figure or listed in the work text explaining the figure. If the explanatory part follows the figure name, a colon is placed after the figure name, and a semicolon is placed between the explanations. **If the figure has explanatory text in a foreign language, it shall be translated into English.**

The technical performance of the figures depends on the method of figure acquisition: it is recommended to scan photos, create drawings using *Visio*, *AutoCAD*, *CorelDRAW* or other similar programmes, diagrams – using *Microsoft Excel* or similar programmes, etc. Figures should preferably use the same fonts as the main text.

If a student needs to include screenshots of a programme in his/her work, he/she should choose a method of obtaining them in order to not excessively increase the volume of the electronic file of the work, while ensuring sufficient quality.

*An example of a figure*

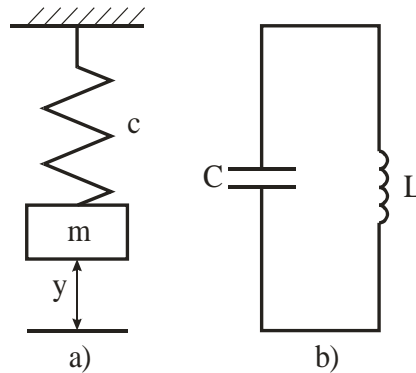


**Fig. 1. Replacement of mechanical oscillation system (a) with electrical oscillation contour model (b):**

$m$  – mass;  $c$  – spring stiffness;  $y$  – mass coordinate;  $L$  – inductance;  $C$  – capacity.

When inserting a figure that is not created by the author, the source of the information used shall be mentioned.

*An example of a figure*



**Fig. 2. Replacement of mechanical oscillation system (a) with electrical oscillation contour model (b) [10]**

$m$  – mass;  $c$  – spring stiffness;  $y$  – mass coordinate;  $L$  – inductance;  $C$  – capacity.

## 4. APPENDICES

Various auxiliary materials, which help to better understand the results obtained during the work, but do not fit into the main content of the work, are added at the end as appendices. A separate page should be inserted before the appendices, on which the word APPENDICES is written in capital letters in the centre of the page.

Each appendix starts on a new page, with the appendix number and heading in the upper right corner of the page. This line is styled to ensure that the appendix number and heading are reflected in the table of contents. A student can also indicate the number of the appendix (without a heading) on each page of the continuation of the appendix with the indication “... continuation of appendix” or “... end of appendix”.

Each appendix shall be referenced in the work, for example, **Appendix 1 includes data on ...** or **see Appendix 1**. For the text included in the appendix, a student can use a smaller character size than the main text and a line spacing of 1 line.

## 5. LIST OF SOURCES AND LITERATURE

The list of literature and other sources of information used are designed according to IEEE international standards. The numbering of the list of used literature is made according to the sequence of its use in the text, which is written in square brackets. E.g., ...encoding [1].

IEEE design styles:

- In the name of the literary source, the author's name or initials are written first, and then the last name. For example, J.E. Bourne.
- Journal articles, scientific articles, or Internet resources should include the name of the article in quotation marks.
- Names of books and journals are written in italics.

**Examples of the description preparation/styling of literary sources**

***Examples of the preparation of book's description***

- [1] J. W. Beard and T. O. Peterson, *A Taxonomy for the Study of Human Factors in Management Information Systems*. Norwood: Ablex Publishing, 1988.
- [2] E. T. Hall, *The Silent Language*. New York, USA: Doubleday, 1959.

***Examples of the preparation of magazine article's description***

- [3] G. Gevorgyan and L. Porter, "One Size Does Not Fit All: Culture and Perceived Importance of Web Design Features," *J. Website Promot.*, vol. 3, no. 1, pp. 25–38, 2008.
- [4] J. Lazar, A. Dudley-Sponaugle, and K. D. Greenidge, "Improving Web Accessibility: a Study of Webmaster Perceptions," *Comput. Human Behav.*, vol. 20, no. 2, pp. 269–288, 2004.
- [5] E. T. Loiacono, N. C. Romano, and S. McCoy, "The State of Corporate Website Accessibility," *Commun. ACM*, vol. 52, no. 9, p. 128, Sep. 2009.

***Examples of the preparation of scientific paper's description***

- [6] X. Sun and Q. Shi, "Language Issues in Cross Cultural Usability Testing: A Pilot Study in China," in *UI-HCII'07 Proceedings of the 2nd International Conference on Usability and Internationalization*, 2007, pp. 274–284.
- [7] A. Zacepins, N. Bumanis, and I. Arhipova, "Administration of government subsidies using contactless bank cards," in *ICEIS 2014 - Proceedings of the 16th International Conference on Enterprise Information Systems*, 2014, vol. 3, pp. 128–132.

***Examples of the preparation of electronic source's description***

- [8] Umer, "Java Card Development Tools," 2012. [Online]. Available: <http://umer555.wordpress.com/category/java-card/>. [Accessed: 05-Feb-2014].
- [9] G. Purdy, "Rhomobile: Automating App Development across Multiple Mobile Platforms," 2011. [Online]. Available: <http://www.mobiletrax.com/Newsletters/tabid/115/EntryId/99/Rhomobile-Automating-App-Development-across-Multiple-Mobile-Platforms.aspx>. [Accessed: 09-Oct-2014].

NOTE! The electronic resource should be specified as precisely as possible. It is not allowed to refer to an entire portal, for example, [www.microsoft.com](http://www.microsoft.com)

***Examples of the preparation of bachelor's or master's thesis description***

- [10] N. C. Fernandez, "Web Site Localisation and Internationalisation: a Case Study," City University, 2000.

The other styling types of other sources description, which are not included in the sample, should be formatted according to the reference guide accepted by IEEE (<http://www.ieee.org/documents/ieeecitationref.pdf>).

# **APPENDICES**

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

**JĀNIS BĒRZIŅŠ**

**Evaluation of the equipment speed**

**Course work in the subject "Peripheral equipment"**

**Supervisor:** ..... Dr.sc.ing., prof. P. Zeltiņš  
*signature, date*

**Consultant:** ..... Mg.sc.ing., lect. G. Zariņš  
*signature, date*

**Author:** ..... Matr. No. IT04521 J. Bērziņš  
*signature, date*

**Submitted:** .....

**Defended:** .....

**Grade:** .....

**Jelgava 2023**

2. Appendix. A sample title page for a Bachelor's thesis for a professional study program  
**LATVIA UNIVERSITY OF LIFE SCIENCES AND TECHNOLOGIES**  
**Faculty of Information Technologies**  
**Department of Computer Systems**

**JĀNIS BĒRZIŅŠ**

**Definition and implementation of software  
development process quality measurements for the  
EKSPLO project**

**Bachelor thesis  
for obtaining a professional bachelor's degree  
in information technologies**

**Supervisor:**

.....  
*signature, date*

Dr.sc.ing., prof. P. Zelčiņš

**Consultant:**

.....  
*signature, date*

Mg.sc.ing., lect. G. Zariņš

**Author:**

.....  
*signature, date*

Matr. No. IT04521 J. Bērziņš

**Jelgava 2023**

3. Appendix. A sample title page for a Bachelor's thesis  
for a study program "Computer Control and Computer Science"

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

**JĀNIS BĒRZIŅŠ**

**Research and evaluation of possibilities for graphical  
illustration of numerical methods**

**Bachelor thesis  
for obtaining an engineering bachelor's degree  
in computer control and computer science**

**Supervisor:**

.....  
*signature, date*

Dr.sc.ing., prof. P. Zeltiņš

**Consultant:**

.....  
*signature, date*

Mg.sc.ing., lect. G. Zariņš

**Author:**

.....  
*signature, date*

Matr. No. IT04521 J. Bērziņš

**Jelgava 2023**

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

**JĀNIS BĒRZIŅŠ**

**Designing and using a testing process to derive  
software quality metrics**

**Master thesis  
for obtaining an engineering master's degree  
in information technologies**

**Supervisor:**

.....  
*signature, date*

Dr.sc.ing., prof. P. Zeltiņš

**Consultant:**

.....  
*signature, date*

Mg.sc.ing., lect. G. Zariņš

**Author:**

.....  
*signature, date*

Matr. No. IT04521 J. Bērziņš

**Jelgava 2023**