Ministry of Science and Higher Education of the Russian Federation

Peter the Great St. Petersburg Polytechnic University

Institute of physics, nanotechnologies, and telecommunications

Higher school of applied physics and space technologies

Project admitted for defense.

by HSAPST Director \_\_\_\_\_\_\_\_\_\_\_ Velichko E.N.

«\_\_\_»\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_2021

**GRADUATE QUALIFICATION PROJECT**

**MASTER’S THESIS**

**THE TITLE OF THE GRADUATE QUALIFICATION PROJECT**

majoring in 11.04.02 Information and Communication Technologies and Systems

Field of study 11.04.02\_05 Microelectronics of Telecommunication Systems (international educational program)

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St. Petersburg

2021

**ABSTRACT**

108 pages, 20 pictures, 3 tables, 7 appendixes

KEYWORDS: …

The subject of the graduate qualification work is “…”.

The given work is devoted to…

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# Introduction

The graduate qualification project must include:

* title page (no page number);
* abstract (no page number);
* content (includes the names of all sections, subsections and paragraphs, indicating the page number on which they start. The title page and abstract are not included in the content, they are drawn up as the main text);
* a list of abbreviations and abbreviations with a decoding (if any in the text);
* an introduction. In the introduction, it is necessary to justify the choice of the topic, characterize the current state of the problem under study, its relevance, practical and theoretical significance, the degree of development of this problem. The introduction should not exceed 4 pages of the total volume of work;
* the main part, structured into chapters with numbers 1, 2, etc. and subsections numbered 1.1, 1.2, ... 2.1, 2.2, etc. (the first chapter - a literature review - should be no more than 25% of the total volume of work);
* conclusion (2 - 5 pages, presentation of the results of the qualification work in comparison with the general goal and the tasks set; formulation of the author's judgment on scientific novelty and the practical value of the work; proposals for the implementation of the results, prospects for the continuation of the work);
* list of used literature (drawn up in alphabetical order);
* appendix (if necessary any additional materials: descriptions of algorithms, intermediate calculations, computer programs, borrowed materials, sketches, drawings, tables, etc.)

**The volume of project is approximately 50 - 70 pages (up to 90 pages) for master students and 30 - 50 pages for bachelor students.**

# Chapter 1. Requirements

1.1. Structure and contents

The graduate qualification project should be a completed theoretical or experimental research related to urgent scientific and technical problem related to the educational program.

**In the introduction**, current topic of the work and its place in modern science should be formulated, a brief description of the object and research should be given. It is necessary to justify the significance of the expected results.

There should be **no more than 3-4 main chapters** in the work. The first chapter is devoted to an analytical review of the publications in the area under study. In it, it is necessary to present an analysis of the known results, where it should be shown that the topic in the published works is not fully disclosed, indicated the problems that need to be solved in this regard, and informed which problem the presented dissertation is devoted to. At the end of the first chapter, you should formulate the goal of the work, and the tasks that need to be solved to achieve it. The literature review should contain information only on the topic that the work is devoted to, and should not exceed 25% of the volume of the project.

**The main chapters** of the work should be devoted to a detailed description of the research object, research methods or techniques, discussion of the results research.

In conclusion, it is necessary to:

• give the main results of the work;

• briefly note the novelty of the results of the work;

• assess the degree of solution of the task.

Conclusion should be a concentrated summary of the work, its volume should be 2–4 pages.

Manuscripts of final qualifying works should be formatted according to the rules presented below. Details can be found in "ISO 5966-82".

1.2. Format rules

* The text of the work is printed on A4 paper. The final format requirement is set at the higher school.
* Recommended for A4 format: Font Times New Roman, size 14, spacing - 1.5. Margins - 2 cm above and below, 3 cm on the left, 1 cm on the right. One-sided printing.
* The text must be justified, hyphenations must be made in it (hyphenations are not allowed only in titles).
* The indentation must be the same and equal to 1 or 1.25. One paragraph should not occupy more than half a page.
* For the title page use the template.
* The text is divided into chapters, sections and subsections. Chapters should have serial numbers within the entire document, designated by Arabic numerals (called: CHAPTER 1.…). Sections should be numbered within each Chapter. A subsection number consists of section and subsection numbers, separated by a dot. A full stop is put at the end of the section and subsection number.
* Each heading of the first level (content, abstract, introduction, chapter titles, conclusion, bibliography, appendix (s)) begins on a new page. They are printed in capital letters, in bold type, without a dot at the end, aligned in the center, WITHOUT underlining, word transferences are not allowed. The distance between headings and text should be at least two spacing (you can skip one line).
* Headings of sections (subheadings) begin with paragraph indentation, typed with a capital letter, in bold, without a period at the end, without underlining.
* Page numbering: all pages, starting with the contents, should be numbered at the top of the page to the right at 10 mm from the edge of the sheet in Arabic numerals. The title page is considered page 1 and is not numbered, the task is filed after the title page and is considered page 2 (not numbered), the abstract is considered page 3 and also not numbered. The following text (content) is numbered starting from page 4.
* Units of measurement are placed behind the numerical values of quantities separated by a non-breaking space (ctrl + shift + space), a line break is not allowed. Example: 10 m/s
* This document can be used as a template

1.4. Equations

Equations are numbered with Arabic numerals within the chapter. First, the number of the chapter is indicated in Arabic numerals, then (after the dot) the ordinal number of the formula in this chapter. Equation numbers are enclosed in parentheses and aligned to the right of the sheet. For example:

“The main time at a separate i-th transition is determined by the equation

, (1.6)

here *Li* is the pathlength, *Sоi* istool feed at the i-th transition (mm/rot), *nшпi* stands for rotation frequency ».

A number that does not fit in the line is placed on the next line below the equation. The place of the number when transferring the equation is at the level of the last line.

References in the text to the ordinal numbers of the equations are given in brackets (in the equation (1.6)…). It is necessary to number only those formulas to which there is a reference in the text.

1.5. Figures and tables

1.5.1. Figures

Pictures are any illustrations (graphs, diagrams, photographs, diagrams). They should be located immediately after the text in which they are mentioned for the first time, or on the next page, if the dimensions do not allow placing the picture after the text. The text must provide a link to the figure (in this case, they write an abbreviation - Fig. 1.1).

The number and title of the figure are written under the figure (for example, Fig. 1.1. Title). The figure number depends on the chapter number: the first number is the chapter number, the second is the figure number in this chapter.

From the text to the upper edge of the figure and from the lower edge of the figure caption to the text 2 intervals (1 cm) are spaced. The captions should be 12 pt in size and centered within the boundaries of the width of the picture (if it is more than one line, then the lines are written through a single interval). From the figure caption to the following text, 2 intervals are spaced.

Charts should be drawn up according to the rules (the names of the axes, units of measurement, the font must be readable). Figures are centered, paragraph indentation is removed. Scanned images are not allowed.

*Example:*

Рис. 1.1. Temperature versus reference voltage

1.5.2. Tables

The table should be placed immediately after the text in which it is mentioned for the first time, or on the next page. The table is designated by the word “Table”, a serial number and a name. Tables are numbered similarly to figures in Arabic numerals (for example, Table 1.1 (first table of the first chapter)). Examples of references to tables in the text of the work: ... .. in table 1.1 ... .. (table 1.1). Tables use a smaller line spacing and smaller font sizes (eg 12 or 10).

*Example:*

Table 1.1

Parameters of the…

|  |  |  |  |
| --- | --- | --- | --- |
| № | Parameter |  |  |
| 1 |  |  |  |
| 2 |  |  |  |
| … |  |  |  |

One blank line is left after the names of figures and tables. The names of figures (and tables) should be on the same page as figures (tables).

# References

Literature sources in the list are numbered alphabetically. Literature references are given in square brackets before punctuation marks. For example:… [4, 7-9]. In the list of references, at least half of the sources must be no older than 10 years.

1.6.1. Books

1. Timoshenko S.P., Young D.H., Weaver W. Vibration problems in engineering. 4th ed. — New York: Wiley, 1974. — 521 p

2. Brooking A., Jones P., Cox F. Expert systems. Principles and case studies. — Chapman and Hall, 1984. —231 p.

3. Ahmed F. Dynamic Light Scattering Experiment DLS — University of Florida, Department of Physics, 2012 — P. 17.

1.6.2. Papers

4. Kunik M., Petrov A.A., Warnecke G. Kinetic schemes for the ultra-relativistic Euler equations // J. Comput. Phys. — 2003. — 187. N 2. — P. 572 – 596.

5. Shuai M., Jin Sh., Thomas J. C., Xinjun Z., Wei L., Xianming S. Improved inversion procedure for particle size distribution determination by photon correlation spectroscopy // J. Applied Optics. — 2012 — V. 51, N 25 — P. 6220 – 6226.

6. Porter P.L., Kamper S.G., Wal M.V., Blankespoor R., Sinniah K. Estimating kinetic and thermodynamic parameters from single molecule enzyme inhibitor interactions // J. Langmuir. — 2008. — V. 24, N 20. — P. 11556 – 11561.

1.6.3. Electronic resourses

7. APA Style (2011). Available at: http://www.apastyle.org/apa-style-help.aspx (accessed 05.02.2011).

8. Some D., Kenrick S. Characterization of Protein-Protein Interactions via Static and Dynamic Light Scattering // J. Protein Interactions — 2012 — P.401 - 426 — URL: http://www.intechopen.com/books/protein-interactions/characterization-of-protein-proteininteractions-via-static-and-dynamic-light-scattering (accessed: 16.05.2015).