# 1 GENERAL REQUIREMENTS

Diploma thesis is a technical document that must be executed in compliance with documentary standards adopted in the National Technical University “Kharkiv Polytechnic Institute”.

The thesis generally comprises:

1) Title pages;

2) Abstract;

3) Contents;

4) Abbreviations;

5) Introduction;

6) Manuscript body;

7) Conclusions;

8) References;

9) Appendixes (if any).

# 2 GENERAL REQUIREMENTS FOR THE MANUSCRIPT EXECUTION

a) The manuscript must be typed on A4 sheets (297 mm × 210 mm).

Tables, figures, and appendixes are permitted to execute on A3 sheets (297 mm × 420 mm). The A3 sheet is then bound by 297 mm edge and folded in half to A4 sheet.

The pages must have margins. The left, bottom and top margins are not less than 20 mm; the right margin is not less than 10 mm.

b) The manuscript pages are numbered with Arabic numerals in the upper right-hand corner without any signs. The numbering must be continuous throughout the manuscript.

The title page, which is the first page of the manuscript, is not numbered; however, it is counted in the consecutive numbering.

c) The manuscript must be typed with 1.5 line spacing and 14 pt. size Times New Roman font. In case the last text paragraph or figure caption on the page fails to fit the page, the line spacing can be changed within 1.3 through 1.5 interval.

d) Table texts, figure content explanations, and notes are permitted to type with 12 pt. size Times New Roman. However, the table line height must equal or more 8 mm (adjusted in "Table properties window").

e) The manuscript body must be typed with 1.25 mm indention. The text in tables is allowed to type without indention.

f) The alignment of the body paragraphs must be justified.

g) Hyphenation must be turned on.

h) Mistakes, misprints and graphical inaccuracies in the printed manuscript are permitted to correct by whitening.

## 3 STRUCTURAL ELEMENTS OF THE MANUSCRIPT

### 3.1 General requirements

Such structural elements of the manuscript as abstract, contents, abbreviations, introduction, conclusions, and references must each begin a separate sheet.

The heads ("ABSTRACT", "CONTENTS", "ABBREVIATIONS", "INTRODUCTION", "CONCLUSIONS", "REFERENCES", "APPENDIX") are typed semibold in capital letters and aligned symmetrically to the text without numbering and underlining and with no dot at the end.

### 3.2 Abstract

a) Abstract is a brief summary of the thesis that contains the basic details and conclusions required for the primary introduction into the project or research.

b) Abstract must contain information on the manuscript volume, key words, and text. The abstract size may not exceed one page.

c) Information on the manuscript volume includes the number of pages, figures, tables, references, and appendixes.

d) Key words must give a clear insight into the thesis and contain 5 through 15 words (word combinations) typed in capital letters and separated by commas.

A key word is a word or word combination from the text that is meaningful in terms of information retrieval.

e) The text of the abstract must address the topic of the thesis and include the object (subject), objective, techniques, and results of the research or project. The text of the abstract is not divided into paragraphs.

f) The page of the abstract is not numbered and not counted in the total number of pages.

### 3.3 Abbreviations

a) If the text contains abbreviations, symbols, subscripts, measurement units that are not covered by the current standards and specific terminology, their list must be given on a separate page.

b) In the list, abbreviations and symbols are placed in alphabetic order on the left and their meaning – on the right.

c) The list order is the following: abbreviations, alphabetic notations, equation symbols, chemical element symbols, measurement units, and terms.

d) Regardless of the separate abbreviation list, abbreviations in the text must be explained when first mentioned.

### 3.4 Introduction

a) Introduction presents a brief state-of-the-art overview of the scientific (engineering) problem considered in the project and focuses on the importance, originality and topicality of the subject. Introduction goes without the problem background, references, or common information. Introduction contains neither figures nor tables and occupies no more than three pages.

b) Introduction contains neither figures nor tables. The introduction size must not exceed three pages.

### 3.5 Manuscript body

a) The manuscript body is divided into sections, chapters, paragraphs and items (if required). Paragraphs and items may contain lists.

(**ATTENTION!** Don't confuse manuscript body element names with the same terms in MS Word menu!)

b) Sections, chapters, paragraphs and items must be consecutively numbered, the first figure showing the number of the section, the second figure – the number of the chapter, the third figure – the number of the paragraph, the fourth figure – the number of the item.

For example, "2.3.1.4 The selected equipment specification" introduces item 4 titled "The selected equipment specification" in paragraph 1 in chapter 3 in section 2.

Below in the box is given an example of the manuscript body structure.

| | | |
|---|---|---|
| 1 HEADING OF 1st SECTION | 2 HEADING OF 2nd SECTION | 3 HEADING OF 3rd SECTION |
| 1.1 Heading of 1st chapter | 2.1 Heading of 1st chapter | 3.1 Heading of 1st chapter |
| 1.1.1 Heading of 1st paragraph | 2.1.1 Heading of 1st paragraph | 3.1.1 Heading of 1st paragraph |
| 1.1.1.1 Heading of 1st item | 2.1.1.1 Heading of 1st item | 3.1.1.1 Heading of 1st item |
| 1.1.1.2 Heading of 2nd item | 2.1.1.2 Heading of 2nd item | 3.1.1.2 Heading of 2nd item |
| 1.1.2 Heading of 2nd paragraph | 2.1.2 Heading of 2nd paragraph | 3.1.2 Heading of 2nd paragraph |
| 1.1.2.1 Heading of 1st item | 2.1.2.1 Heading of 1st item | 3.1.2.1 Heading of 1st item |
| 1.1.2.2 Heading of 2nd item | 2.1.2.2 Heading of 2nd item | 3.1.2.2 Heading of 2nd item |
| 1.2 Heading of 2nd chapter | 2.2 Heading of 2nd chapter | 3.2 Heading of 2nd chapter |
| 1.2.1 Heading of 1st paragraph | 2.2.1 Heading of 1st paragraph | 3.2.1 Heading of 1st paragraph |
| 1.2.1.1 Heading of 1st item | 2.2.1.1 Heading of 1st item | 3.2.1.1 Heading of 1st item |
| 1.2.1.2 Heading of 2nd item | 2.2.1.2 Heading of 2nd item | 3.2.1.2 Heading of 2nd item |
| 1.2.2 Heading of 2nd paragraph | 2.2.2 Heading of 2nd paragraph | 3.2.2 Heading of 2nd paragraph |
| 1.2.2.1 Heading of 1st item | 2.2.2.1 Heading of 1st item | 3.2.2.1 Heading of 1st item |
| 1.2.2.2 Heading of 2nd item | 2.2.2.2 Heading of 2nd item | 3.2.2.2 Heading of 2nd item |

c) Headings of sections are typed in semi-bold capital letters and with centered alignment. The section heading are allowed to set with the indentation.

d) Headings of chapters, paragraphs and items are typed in semi-bold lower-case letters with the first capital letter and set with 1.25 mm indentation.

e) Between the section heading and the chapter heading, there must be a spare line (21 pt). The same spacing must be between the chapter heading and the text (if there are no paragraphs in the chapter).

The spacing between the paragraph heading and item heading as well as the paragraph (item) heading and the further text must be the same as that in the text.

Between the text of the previous chapter and the heading of the next chapter, there must be a spare line (21 pt.).

The spacing between the text and the following paragraph (item) heading must be the same as that in the text.

f) Each section of the manuscript starts with a new page.

g) Lists in the text are marked by one of the following ways (see the example in the box below).

1) Arabic numerals with a closing bracket (e.g. 1);

2) etc.

a) lowercase Latin letters with a closing bracket (e.g. a);

b) etc.

– symbol “dash”;

– etc.

h) The text of the list along with the list designation is typed in lowercase letters with the indentation and semicolon at the end of each item of the list (except the last one that ends with a dot).

### 3.6 Conclusions

a) Conclusions give brief results of the project (research) executed and proposals on its application as well as techno economic assessment of the project and its implementation.

### 3.7 References

a) References is a list of cited, mentioned, and used sources of information. Sources of information are books, articles, technical standards, surveys, research reports, doctorial theses, regulations, instructions, catalogues.

b) References include all sources of information cited in the text.

c) In the reference list, the sources of information are given in the order in compliance with their first citation in the text. The information source number in the reference list is the number of its citation. An example of references is given in Appendix A.

d) The bibliographic entry of the information source in the reference list must be given in the same manner as in the source (at the title or reverse page, or in other elements of the document that contain the imprint).

e) In case it is necessary to present sources of information that are not cited in the text, they are given in the appendix.

### 3.8 Appendix

a) Figures, tables, auxiliary mathematical calculations, or supplemental documents can be introduced as appendixes.

b) Appendix is a continuation of the text with common page numbering. Each appendix starts a new page.

c) Figures, tables, and formulas are numbered within the appendix, e.g. figure A1 – the first figure in Appendix A; table B4 – the fourth table in Appendix B.

d) In case of references to figures in the text of the appendix, full or abbreviated form must be used, e.g. “in fig. A2”.

e) Appendixes may present original copies of documents. In such cases, they are introduced with a separate paper sheet at which the word “APPENDIX” and its heading are typed in the middle of the page. The document pages are numbered consecutively with the text.

f) All appendixes must be cited in the text of the manuscript and attached in compliance with the citations. The appendixes and their headings must also be mentioned in the contents.

### 3.9 The text elements

Formulae, equations, tables, figures, abbreviations, signs, physical units, notes, and citations are elements of the text

#### 3.9.1 Formulae and equations

a) Formulae are placed within the text or in separate lines.

Within the text, simple formulae are placed.

The principal formulae used for computations are placed in separate lines, one formula per line. The formula is aligned symmetrically to the text and separated with a spare line over and under it. The line spacing for a chain of formulae is similar to that of the text.

b) The principal computing formulae and formulae that are referred to further on in the text must be numbered. The formula numbering is made within the text section. The formula number is given in parentheses by the right margin (see the example in the box below).

$$U = I \cdot R \qquad (3.5)$$

The formula number contains the number of the manuscript section and the sequence number of the formula in the section, the numbers separated with a dot. In the above-given example, “3” denotes section 3 and “5” shows that it is the fifth formula in the section.

In case the formula occupies a few lines, the number is given in the last line.

c) The formula can only be extended to the next line at the operational signs, the sign repeated at the beginning of the next line. In case the formula is extended to the next line at the product, multiplication sign × is used. The formula continuation to the next line at the division is not recommended.

Formulae given in series are separated with a comma, the last formula ending with a dot.

d) Formula characters expressed in Latin letters are typed in italics. Characters expressed in Greek letters are typed upright.

e) Explanation of the formula characters and numerical coefficients, if they are not explained elsewhere above in the text, must be given straight under the formula in a new line starting with the word “where”. The characters are introduced in the same order as they are written in the formula, each character in a separate line. The formula is separated from the characters explanation with comma.

There is a spare line between the formula and the characters explanation. The further text goes after the characters explanation from the next line (without a spare line).

f) When the numerical value of the character is introduced, it is given after the character explanation given from the next line with 1.25 mm indentation, e.g.

$$U = I \cdot R \qquad (3.5)$$

where $U$ – voltage, V;

$I$ – current, which equals 2.2 A;

$R$ – resistance, which equals 100 Ohm (or 100 Ω).

The characters are placed directly one after another.

g) Character units must not be written near the formula given in the analytical form. The correct and incorrect entries are shown below.

| Correct: | Incorrect: |
|---|---|
| The voltage $U$, V, is calculated as | The velocity: |
| $U = I \cdot R$ | $U = I \cdot R$, V |

h) Numerical formula and the calculation are given (if required) in the new line without numbering. The parameter unit is shown after the result, e.g.

$$U = I \cdot R, \qquad (3.5)$$

$$U = 2.2 \cdot 100 = 220 \text{ V}.$$

i) If a parameter unit consists of several units, the latter are separated with a dot in the middle line, e.g. $A \cdot m^2$; $kWh/(m^2 \cdot day)$.

### 3.9.2 Tables

a) Numerical values of parameters are recommended to introduce into the text in a tabulated form to the convenience of reading. Every table must be referred to in the text above the table.

All the tables must be cited in the text.

b) Every table must have a number and a heading. The heading is separated from the table number with a dash and typed in 14 pt. size Times New Roman lower-case letters with the first capital letter and set with left alignment and 1.25 mm indentation. There must be no dot at the end of the heading.

The text of the table is allowed to type in 12 pt. size Times New Roman font.

An example of the table entry is given below.

Table 4.8 –Investments into the rooftop photovoltaic plant

| The plant equipment | Number | Price per unit, $ USA | The total cost, $ USA |
|---|---|---|---|
| Photovoltaic module Trina Solar TSM–300PD14 | 51124 | 245 | 12,525,380 |
| Inverter SMA Sunny Tripower 5000TL-20 | 250 | 1620 | 405,000 |

c) The table number contains the number of the manuscript section and the sequence number of the table in the section, the numbers separated with a dot. In the above-given example, “4” denotes section 4 and “8” shows that this table is the eighth in the section.

d) The table must be placed right under the text where it is first mentioned or at the top of the next page, with full or center alignment. It is allowed to fit the table along the longer side of the sheet (landscape layout).

e) The table is separated from the text with a spare line over the table heading and underneath the table.

f) When the table is split into several parts, the column headings are allowed to substitute with Arabic numbers placed in the line right after the column headings in

the first part of the table. The word “Table” is typed once above the first part of the table on the left. The rest of the table is titled as “Continuation of the table” or “Ending of table” with the table number indication. In the first and further parts of the table until the last one, the bottom border is not shown.

Below is an example of table splitting.

Table 5.2 – Characteristics of Trina Solar TSM–300PD14 PV module

| Parameter | Value |
|---|---|
| 1 | 2 |
| STC Power Rating | 300W |
| PTC Power Rating | 273.1W 1 |
| STC Power per unit of area | 14.4W/ft2 (154.6W/m2) |

Continuation of table 5.2

| 1 | 2 |
|---|---|
| Peak Efficiency | 15.46% |
| Power Tolerances | –3%/+3% |
| Number of Cells | 72 |
| Nominal Voltage | not applicable |
| Current at maximum power point *I*mp | 8.13A |
| Voltage at maximum power point *V*mp | 36.9V |

Ending of table 5.2

| 1 | 2 |
|---|---|
| Short-circuit current *I*sc | 8.6A |
| Open circuit voltage *V*oc | 45.3V |
| NOCT | 45°C |
| Temp. Coefficient of *I*sc | 0.05%/K |
| Temp. Coefficient of Power | 0.44%/K |
| Temp. Coefficient of Voltage | 0,149V/K |
| Maximum System Voltage | 600V |

### 3.9.3 Figures

a) Every figure must be referred to in the text above the figure. All the figures must be cited in the text.

b) The figure must be placed right under the text where it is first mentioned or at the top of the next page and fit with justified or centered alignment.

It is allowed to fit the figure along the longer side of the sheet (landscape lay-out).

c) Every figure must have a number and a caption. The caption is separated from the figure number with a dash and typed in 14 pt. size lowercase letters with the first capital letter and set with centered alignment in accordance with the figure. There must be no dot at the end of the caption.

Below is an example of a figure entry.

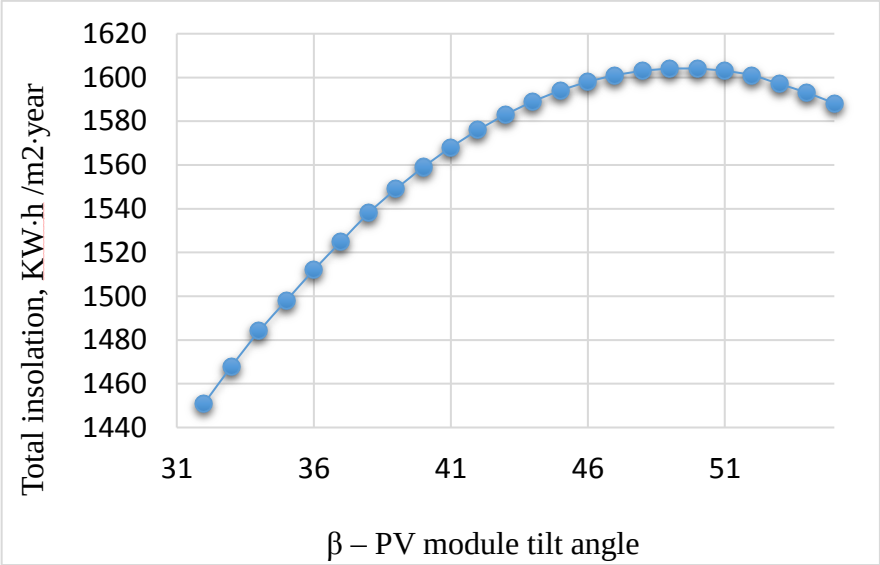



Figure 3.1 –The total insolation incident on a PV module versus tilt angle, KW·h/m$^2$·year

d) The figure number contains the number of the manuscript section, where the figure is inserted, and the sequence number of the figure in the section, the numbers separated with a dot. In the above-given example, “3” denotes section 3 and “1” shows that this figure is the first in the section.

e) If the figure contains a few figures or numbers and abbreviation, their explanations must be given between the figure and the figure caption. The explanations

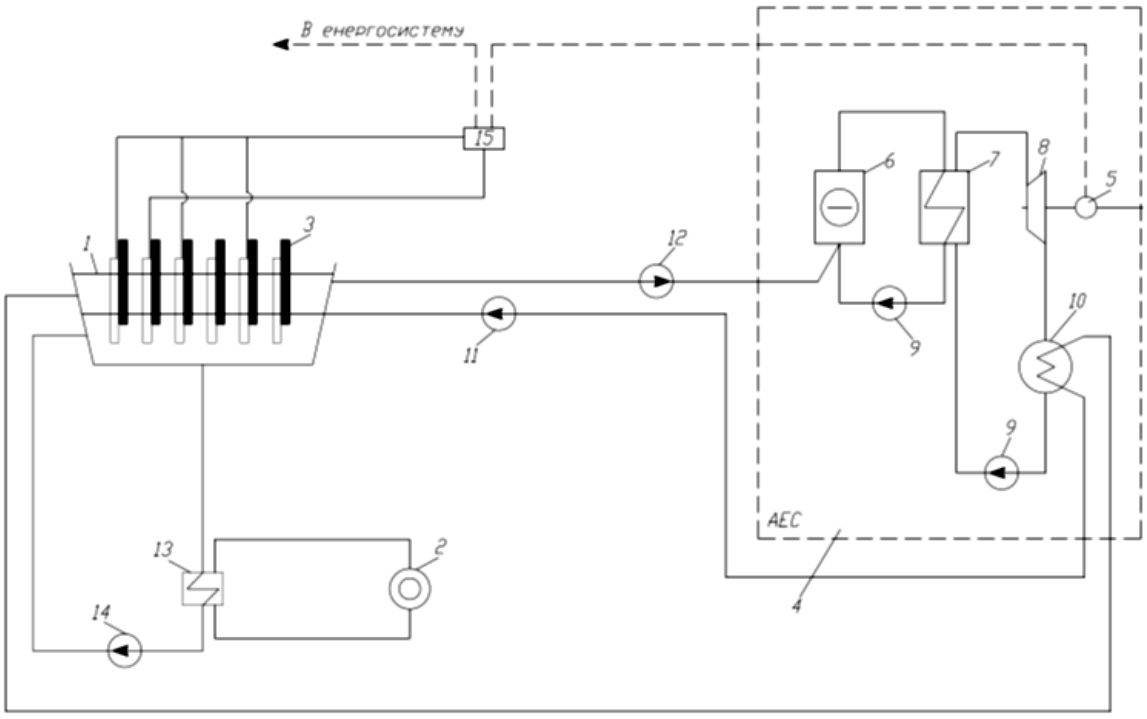
may be typed in 12 pt. size font and separated from each other with a semicolon, no sign at the end.

Below are given examples of the correct description.

a) b)

a) flat solar collector VFK 145 V; b) vacuum solar collector VTK 1140/2

Figure 5.1 – Solar collectors Vaillant auroTHERM




1– solar pond; 2– heat consumer; 3– electrodes; 4– nuclear plant loop; 5 – generator; 6– nuclear reactor; 7 – steam generator; 8– steam turbine; 9, 11, 12, 14 – circulation pumps; 10 – steam condenser; 13– heat exchange; 15 – converter

Figure 1.10 – Combined system of a solar pond and a nuclear power plant

f) Figures are separated from the text with a spare line over the figure and underneath the figure caption.

### 3.9.4 References

a) In the manuscript, there may be references to various structural elements of the text and other documents (standards, specifications, publications, etc.).

b) References to the text section (chapter, paragraph, and item) are introduced with the words “in accordance with chapter 2”, “according to chapter 3.1”, “in compliance with paragraph 4.2.2” or “see 2.1.2”, “under item 2.3.1.4”

c) References to the table, figures, formulae and appendixes given in the text, are introduced the following way:

– “given in table 2.4” or “as shown in table 4.3”;

– “according to fig. 3.2” or “from fig. 3.2”;

– “as shown in fig. 3.4” or “as can be seen in fig. 3.4”;

– “from equation (2.1)”, “in formulae (5.7 – 5.10)”, “from (2.1)” or “as follows from (2.1)”;

— “given in Appendix A” or “described in Appendix B”.

d) For repeated references, the word “see” is used:

“see table 6.1”; “see fig. 2.4”; “see (2.4)” or “see expression (2.4)”; etc.

e) References to information sources are designated by consecutive numbers in square brackets the following way: “in papers [3,4]”, “the authors of [14]”, “data taken from [7, table 34, p.98]”, “fig. 1.7 in [21, p.18]”, etc.

The source of information is numbered as it is first cited in the text. If this source of information is again cited further on in the text, its number is repeated.

f) In the text, references to standards or specifications only give their IStd desc. (descriptions) without the year.

g) In the reference to a structural element of the information source, the element number and heading are given. When the reference is repeated, only the number is given.

## 4 REQUIREMENTS FOR DIPLOMA PROJECT DOCUMENT INTEGRATION

a) The documents, namely title page, list of documents, project assignment, and the manuscript must be stitched into a book.

b) Graphic documents executed in A2, A1, or A0 sheets are submitted unfolded or rolled-up to the State Examination Board.

## 5 DIPLOMA PROJECT PREPERATION FOR THE DEFENCE

a) The student has the completed diploma signed by the consultants on the project economics, labor safety and normative compliance and submits to his academic supervisor.

b) The academic supervisor assesses the diploma project readiness for the defence, signs the project, and writes a report stating his opinion about the student's work.

c) On the basis of the academic supervisor's report, the Head of the Department or an authorized person makes a decision on the student's admission to defence and signs the title page.

d) The diploma project admitted to defence is sent to an external reviewer.

The reviewer assesses the project in terms of importance of the topic, clarity of the text presentation, completeness of analysis and computations, correctness of the results obtained and the conclusions made.

e) The signed diploma project with the academic advisor's report and the external reviewer assessment is submitted to the State Examination Board for defence.

f) After the defence, the diploma manuscript with all attached documents is transferred to the University Repository for keeping.