

Recommendations on the form of the engineering / master's thesis for use at the Faculty of Geodesy and Cartography of the Warsaw University of Technology

The diploma thesis is a summary of an academic learning process. It proves that the student has mastered the required skills to obtain a diploma entitling him to perform the profession of a geodesist engineer and implement new technologies, i.e. activities related to the use of the acquired knowledge and continuous assimilation of new knowledge. The diploma thesis is primarily related to the course of study and the predispositions of the student. However, the case when the topic of the thesis stems from a need of the production sphere is considered beneficial. It should be emphasized that the thesis is prepared under the supervision and guidance of a tutor. The tutor's tasks include helping to formulate the topic of the work, directing its plan and providing methodological and substantive guidance at every stage of writing.

This study contains general definitions of a master's and engineering thesis, recommendations regarding their structure and style, the way of referring to source materials and other comments that may help students write their thesis. The aim of this study is also to standardize the graphic form of theses written at the Faculty of Geodesy and Cartography. The comments hereinafter contained are primarily recommendations and in no way exempt the author and tutor from the responsibility for its final form.

Engineering thesis

An engineering diploma thesis should be a complete solution to a typical engineering task using the knowledge gained during the studies. In their work, the student should demonstrate the ability to consolidate knowledge and its application to solving an engineering task. In solving an engineering task known technologies and solution methods can be used. The work, however, must be based on unique data and lead to conclusions resulting from the analysis of that data. The engineering thesis should include:

- formulation of assumptions for the selected engineering task,
- analysis of sources and available means and methods of solution,
- design of the task solution algorithm,
- conclusions drawn from the results of analyses or experiments.

Master's thesis

The master's thesis should show the ability to independently solve a research task and constitute a substantive solution to the given task. The research task may be in the form of an engineering task, cover the solution of theoretical problems (i.e. mathematical cartography) or constitute a monographic study involving comparative analyses of used methods, technologies, algorithms or formal and legal issues. In the case of an engineering task, it should present an innovative approach to the proposed solution (i.e. modification of the solution algorithm) or to the tools used (i.e. modification of the measurement technology). In their work the student should demonstrate not only the ability to consolidate the knowledge acquired in their studies, but also the ability to supplement this knowledge with regard to certain specific problems resulting from the undertaken subject. The master's thesis should contain research material on the basis of which it will be possible to prepare a publication or a scientific report.

1. The structure and content of the work

It is required to follow the guidelines contained in the following document: "*Wymogi edytorskie dla prac dyplomowych w Politechnice Warszawskiej*" ("*Editorial requirements for the diploma theses at the Warsaw University of Technology*"); available on the faculty's website in the 'obrona pracy dyplomowej' ('defence of thesis') tab.

The structure of the work should include:

- a. main title page,
 - b. a summary and keywords (in the case of a request of a copy in a foreign language translation, a title and summary of the work in that language should be included),
 - c. declaration of the author of the thesis,
 - d. contents,
 - e. an introduction defining the purpose and scope of the work (numbered as chapter 1),
 - f. chapters containing the "theoretical" part of the work, defining the issues considered and describing the current state of knowledge in the field of the topic of the work,
 - g. chapters containing own research, including:
 - a part describing the method used to solve a specific problem – set hypotheses and research/engineering problems, a description of the tool and method used to solve the task,
 - a part containing an analysis of obtained results, together with detailed conclusions,
 - h. a chapter presenting the results, in accordance with the adopted purpose of the work,
 - i. a summary (final conclusions, conclusion) – a presentation of the results in relation to the purpose of the work, recommendations for the future, proposed changes and improvements, etc.,
 - j. bibliography (references, literature),
 - k. a list of symbols and abbreviations,
 - l. a list of figures,
 - m. a list of tables,
 - n. a list of attachments,
 - o. attachments.
- Keep in mind that the work consists of chapters (apart from the introduction and summary) with similar number of pages (cases with chapters of disproportionate

number of pages, i.e. one chapter has 50 pages and another has 5 pages, should be avoided), in particular, the theoretical and practical part of the work should have a similar number of pages and overly expanding one part at the cost of the other should be avoided.

- The total number of pages of the thesis is not crucially important (recommended: **30-50** pages for the engineering thesis and **60-80** pages for the master's thesis), **the content of the thesis is most important**. Increasing the margins, spacing between words and letters, and applying other graphical changes that merely increase the volume of the work are unnecessary and unwelcome, and should also be avoided.
- There should be no spaces before punctuation marks (except for opening a parenthesis, opening quotation marks and a hyphen), but also before and after inside of quotation marks and parentheses. Each sentence should start with a capital letter.
- Bullet points or numbering should start with an uppercase or lowercase letters depending on the content of the points (sentences need to start with a capital letter, simple listings do not).
- The pages of the work must be numbered except for the title page, even though the title page is the first page of the work (page no. 1).
- Each large (fundamental) chapter of the work should begin on a new page. Situations in which a subsection title is on the last line of a page or the text ends with one line on a new page should be avoided.
- Excessive “plunging” into the depth of the structure of the work should be avoided, especially when the subsections become very short, i.e. a subsection numbered 3.2.1.3. containing one paragraph is unacceptable. It is recommended to divide the work into chapters up to the second level of depth (i.e. 3.1.2.).

2. Main title page and abstract

It is required to apply the guidelines contained in the following documents: "*Wymogi edytorskie dla prac dyplomowych w Politechnice Warszawskiej*" ("*Editorial requirements for diploma theses at the Warsaw University of Technology*"), "*Wzór strony tytułowej pracy dyplomowej*" ("*Design for the title page of the diploma thesis*") – available on the faculty's website in the 'obrona pracy dyplomowej' ('diploma thesis defence') tab.

The title page is a showcase of the work and its author. It should therefore be made lucid and contain only the necessary elements without unnecessary ornaments.

The keywords (up to 5) should be provided directly below the abstract. Keywords are single words (i.e. orthophotomap, geodynamics, cadastre) or expressions (i.e. satellite imagery, land register, faith-field projections) that are directly related to the content of the work and allow to identify the subject of the work (i.e. in a database).

3. Figures, tables and formulas

It is required to apply the guidelines contained in the following document: "*Wymogi edytorskie dla prac dyplomowych w Politechnice Warszawskiej*" ("*Editorial requirements for diploma theses at the Warsaw University of Technology*") – point 4 '*Zasady redagowania*' ('*Editing rules*'); available on the faculty's website in the 'obrona pracy dyplomowej' ('diploma thesis defence') tab.

Figures and tables are important elements of the work that in a coherent and lucid way present the results of experiments and analyses. All figures (including photographs and charts), tables and formulas should be numbered in the main chapters so that they can be referenced or referred to. Figures and tables should have their own, unique captions and in case of a table the caption should be above the object (table). In addition, it is recommended that:

- Figures and charts are legible, charts that present too much data should be avoided.
- A period must be placed at the end of a caption (of a figure or table) only if the caption contains a task or several sentences. The same rule applies to chapter titles.
- Figures, charts and tables should be placed as close as possible to their descriptions placed in the work. However, if a table is very large (several pages long), it is better to include that table as an attachment and reference that attachment in the work.
- The caption should always include the source of the presented figure or table, with the exception of the author's own work.
- Use MSEquationEditor or TeX/LaTeX equation editor to write math formulas and equations.

It is a good idea to place captions and objects in tables with "transparent" edges. This allows to effectively avoid problems with captions and objects getting mixed, moved or lost while editing the text. An example for a mathematical formula and a figure is presented below.

$$V = G \iiint_{(M)} \frac{dm}{l}$$

(2.1)



Fig. 2.1. Caption text (source: *Microsoft Clip Gallery*)

4. Style of expression

In the diploma theses, it is most common to use the impersonal form (was done, was/were analysed, conclusions were drawn), however, it is possible to write the work in the first person singular – especially when the author describes his own research (I did, I analysed, I drew conclusions). In addition, the recommendations below should be followed:

- Chapter, table and figure titles should end with a period only if they are sentences, they contain a subject and predicate, i.e. “Satellite measurement technologies” – this title of a section is not a sentence and such title should not end with a period.
- Sentences should be simple, clear and understandable, but not overly simplistic. The general style does not have to be super elegant or scientific, because it usually gives undesired feedback. Colloquial words, phrases and language should not be used.
- A common problem – amount or number? The number concerns countable things, e.g. the number of respondents, enterprises, questions, advertisements, products. The amount applies to uncountable things, divisible continuously, e.g. the amount of water, milk, advertising content on TV, etc.
- The conjunctions and prepositions (mainly in and out) should not be left at the end of a line. To avoid this, it is good practice to use the so-called “hard space”, which usually can be used in a text editor by pressing <Ctrl + Shift + Space>.

5. References to literature

Należy stosować wytyczne dotyczące sposobu odwołań do literatury, redagowania przypisów oraz bibliografii (wg różnych stylów), **które opracowuje Biblioteka Główna PW, aktualizuje oraz umieszcza na swojej stronie internetowej w zakładce pt. „Dla autorów prac dyplomowych i naukowych”**; <http://www.bg.pw.edu.pl/index.php/przypisy-i-bibliografia>

The ability to use literature related to the subject of one's own research, experiments, measurements or comparative analyses is very important in writing or working on one's diploma thesis. It is impossible to write a good thesis without a literature review of the issues raised. Below are some important notes regarding the rules of using literature and quoting:

- The thesis must contain references to the source material. It must be clearly stated where the author uses references. Also, if a master's or engineering thesis of the same author is cited, it should be included in the references list and cited in accordance with the same rules as for any other reference.
- It should never be the case that no literature item has been used in the thesis. Also, the literature list is not a list of literature recommended for reading.
- A work written using the "copy-paste" method or consisting of fragments directly copied from various books (or other literature references, such as magazines) is unacceptable and will be treated as plagiarism. All cited fragments and quotes should be in italics and inside quotation marks, with a reference to the source material.
- In the case of figures and tables created on the basis of another work or literature or copied from another work or literature, the source should be clearly indicated.
- The thesis must include a references chapter (bibliography, literature) which should be a separate part of the work. The list of used literature should be provided in the original languages, in alphabetical order according to the authors' surnames (if sorted alphabetically) and should be divided into printed material and online sources. The list cannot contain items that are not referenced in the text, just as all references in the text must be mentioned in the reference list.

Recommendations for quoting and compiling a list of literature are given in the latter part of this guide, grouped in terms of typical sources (i.e. books, articles, internet sources) and methods of quoting (i.e. citing research results, direct quoting, etc.). This guide does not cover all possible cases, but only gives general ideas of the rules related to quoting.

Quoting and citation

The current, applicable citation style is one in which the author's name and the year of publication are included directly in the text (the so-called Harvard style; the second recommended style is the numbering style according to the PN standard). Typical cases of referencing source material are given below.

1. If the authors are directly referred to in the text, the year should be placed in parentheses and academic titles and degrees can be omitted, i.e.:

Grawimetr balistyczny ZĄBKA (1993) był jedynym polskim instrumentem do pomiarów absolutnych przyspieszenia siły ciężkości, który (...).

2. If a certain idea, thought or research results from other works are referred, then the name of the author of the work and the year of publication should be enclosed in brackets, i.e.:

W monografii *Badania geodynamiczne pienińskiego pasa skałkowego* pod redakcją Czarnieckiego można znaleźć ciekawą interpretację współczesnej geodynamiki pienińskiego pasa skałkowego (CZARNECKA, 2004).

3. If the cited work has several authors, but not more than three, then all the names should be listed. If there are more than three authors, only the name of the first of the authors should be given (*et al.* or *et al.* is an abbreviated Latin expression meaning "and others"), i.e.:

The horizontal surface movement of the Hansa Glacier in Spitsbergen during the summer is around 10-20 cm per day (WALO et al., 2006).

4. When referring to different works by the same authors published in the same year, the publications should be distinguished by letters of the alphabet written right after the year of publication, i.e.:

(...) synchronous trigonometric levelling was used to transfer the height through the Czorsztyński Lake (WALO, PACHUTA and OLSZAK, 2004a, 2004b).

5. When quoting directly from a publication (whether it is your own or that of another author), it should be marked with quotation marks and italics. In such case, the page number from which the quoted text comes from should also be given, i.e.:

(...) w swoim podręczniku CZARNECKI (1996, s. 409) definiuje pojęcie niwelacji satelitarnej w następującym brzmieniu „*niwelacją satelitarną będziemy nazywać procedurę prowadzącą do uzyskania wysokości ortometrycznych na podstawie wysokości geometrycznych (...)*”.

6. When quoting from internet sources the same rules apply as for printed literature (if no author is mentioned on the website, the company name or its abbreviation will suffice), i.e.:

(...) the prospects for the development of the transmission of DGPS differential corrections via the internet are being considered by WÜBBEN (2006).

(...) a complete list of citation and quotation rules and references can be found on the internet (cf. MUL, 2005).

List of literature

Należy stosować wytyczne dotyczące sposobu redagowania przypisów oraz bibliografii (wg różnych stylów), które opracowuje Biblioteka Główna PW, aktualizuje oraz umieszcza na swojej stronie internetowej w zakładce pt. „Dla autorów prac dyplomowych i naukowych”; <http://www.bg.pw.edu.pl/index.php/przypisy-i-bibliografia>