UNIVERSITY OF THE WITWATERSRAND
JOHANNESBURG



FACULTY OF SCIENCE

Style Guide for Theses, Dissertations and Research Reports

Style Guide for Theses, Dissertations and Research Reports

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1. INTRODUCTION

This guide is intended for postgraduates who are preparing to submit their thesis, dissertation or research report for examination. The intention is to provide a concise guide covering all aspects of the required document. It does not, however, aim to provide comprehensive information on detailed stylistic features. Additionally, there are usages which are specific to each of the many subject areas falling under the control of the Faculty of Science. Candidates should therefore consult their supervisors about the specific requirements of their topic and discipline.

It should be noted that the terms thesis, dissertation and research report have specific meanings: a 'thesis' is the document submitted for the degree of Doctor of Philosophy; a 'dissertation' for the degree of Master of Science by research only, and a 'research report' for the degree of Master of Science by coursework and research report. The research report should take the form of a 'mini' dissertation.

The word 'thesis' is used in this document for simplicity, but the information given applies to theses, dissertations and research reports.

2 THE STRUCTURE AND FORM OF THESES, DISSERTATIONS AND RESEARCH REPORTS

This chapter aims to provide information on all matters relating to form and structure in thesis writing; however it is not intended to be an exhaustive resource.

2.1 The structure and form of theses - preliminaries

The essential elements of the thesis are presented below in the order in which they should normally appear.

Title and Title page
Candidate's Declaration (Signed) and AI Declaration
Abstract
Dedication
Acknowledgements
Contents
List of Figures
List of Tables
List of Symbols
Nomenclature
Introductory Chapter
Central Chapters
Concluding Chapter
References
Bibliography
Appendices

2.1.1 Title and title page

A specimen title page is shown in Appendix A. The following information is given on the title page.

Title:
The title should indicate the contents and scope of the thesis in as few words as possible. Phrases like 'a report on investigations into….' and 'observations on some aspects of' add nothing significant to the title and should be avoided. While the title should be as brief as possible it should be accurate, descriptive and comprehensive, clearly indicating the subject of the investigation. It is most important in the view of the Higher Degrees Committee that theses' titles are fully relevant to the contents of the work to avoid misunderstandings at the time of examination. The Title of the thesis must not be in capital letters, unless there are proper nouns (e.g., Sarah, London, Toyota) in your title.

Author's Name:
The full forenames followed by surname are usually given under the title. They should be typed with the first letter of each name in capital letters and the remainder in lower case.

Thesis Statement:
The following are examples of appropriate wording.

Degree of Doctor of Philosophy:

‘A thesis submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy.’

Degree of Master of Science by research only:

‘A dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science.’

Degree of Master of Science by coursework and research:

‘A research report submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science.’

Year when the thesis was completed:
This lowest line should be no more than 25 mm from the foot of the page, and should include the place and date of completion of the thesis, i.e. signed on 28 April 2010 in Johannesburg.

2.3.2 Candidate’s declaration

University regulation G.28 specifies the following:

‘A candidate shall submit a formal declaration stating whether the thesis is their own unaided work, or if assisted, what assistance they have received.’

An example of the conventional form of declaration is as follows:

DECLARATION

I declare that this thesis is my own work. All sources of assistance, including the use of artificial intelligence tools where applicable, have been appropriately disclosed. It is being submitted for the Degree of Doctor of Philosophy** at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

_____

(Signature of candidate)

_____day of _____20_____at_____

Student number:

Candidate signature:

Date:

* dissertation or research report as applicable

** or Master of Science as applicable.

This declaration should appear on a separate page and each copy of the thesis should be individually signed by the candidate.

Artificial Intelligence (AI) Disclosure
The use of artificial intelligence (AI) tools in the preparation of a thesis must be transparently disclosed. Candidates remain fully responsible for the originality, accuracy, integrity and scholarly content of their work. Any use of AI tools for tasks such as language editing, summarisation, coding assistance, data visualisation or other research-related activities should be declared in accordance with current University requirements. AI tools may not be listed as authors, and their use does not replace the candidate's responsibility for proper citation, critical evaluation and academic integrity.

https://www.wits.ac.za/media/wits-university/faculties-and-schools/science/documents/docs-science/PG%20student%20AI%20declaration%202024.docx

Where generative AI tools have materially contributed to research methods, data analysis, code development, computational workflows or the interpretation of results, candidates must describe the relevant use in the appropriate section of the thesis, dissertation or research report. The description should identify the tool and its role in the research, and provide sufficient information about the workflow for the work to be understood and evaluated. Where AI-generated code or scripts are used, candidates remain responsible for verifying their accuracy, documenting relevant modifications and ensuring that the reported methods and results are reproducible. Where appropriate, scripts, prompts, model or tool versions, and other supporting documentation may be included in an appendix or supplementary research materials. AI tools must not be listed as authors. Candidates must follow current University requirements and any applicable disciplinary or publication standards.

2.1.3 Abstract

The abstract is a brief informative summary of not more than 150 words for a master's dissertation or research report and not more than 350 words for a doctoral thesis. It outlines the purpose of the thesis, the research methods and procedures employed, as well as the major results and conclusions. The abstract should always start with a topical sentence that is a central statement of the major theme of the thesis.

The abstract is extremely important. It should give as concisely as possible the significant facts, especially anything new, the main conclusions and any recommendations. An abstract should be written in normal and not telegraphic style. (See section 8.2 on the University's requirements for abstracts.)

2.1.4 Dedication

This is a brief, optional statement paying tribute to the writer's spouse, family, or other associated person. It is typed centrally on a separate page starting on the chapter line and does not require a heading, e.g.

In memory of my mother

Ruby Johnson

1896 – 1975

2.1.5 Acknowledgements

Assistance received in carrying out the work in preparing a thesis should be acknowledged, although it is not usual to acknowledge routine checking, minor assistance or general advice. It is, however, usual to acknowledge financial assistance, permission to publish, as well as special facilities provided by a company, university or research institution. Funding bodies, grant numbers, permits and ethical clearance approvals should be acknowledged where applicable.

2.1.6 Contents

The contents should be given on a separate sheet and follow the plan of the structure of the thesis (Section 2.1 above) and the headings in the thesis itself. The contents should only contain the first three levels of headings in the thesis. It must also include the relevant page numbers. (A specimen contents page is shown in Appendix B.)

2.1.7 List of figures

A list of figures follows the contents on a new page, and precedes a list of tables. (A specimen list of figures is shown in Appendix C.)

2.1.8 List of tables

A list of tables follows the list of figures on a new page. (A specimen list of tables is shown in Appendix D.)

2.1.9 List of symbols

Each thesis should provide a list detailing the symbols for physical quantities used. These symbols vary from discipline to discipline and candidates should consult their supervisors with regard to the correct symbols for their field of research.

2.1.10 Nomenclature

Authors should avoid jargon and abbreviations which are not in common use in the field or which have not been defined. If there are acronyms or unusual technical terms, these should be defined in alphabetical order in a table or listed. If there are only a few, they may be defined when they first occur in the text.

2.2 Body of the thesis

In most theses, the chapters may readily be divided into three categories: the introductory chapter or chapters; the central chapters comprising the major report of the study, divided into logical chapter divisions (publishable/ published manuscripts); and the concluding chapter or chapters, which should contain the findings, conclusions and recommendations of the report.

2.2.1 Introductory chapter(s)

The first chapter, or chapters, should contain the following items:

- A clear and complete statement of the problem investigated, the hypotheses tested or the purpose of the study.
- A validation or justification of the problem, which eloquently establishes the importance of the problem through substantiated arguments. It is often appropriate, at this point to indicate the limitations of the undertaking and to define words unique to the study or used in a restricted or unusual manner in reporting the investigation.
- A preview of the organisation of the thesis. This will make it easy for the reader to see at a glance the relationship between the various parts of the work.
- A résumé of the history and present status of the problem by means of a literature survey comprising a brief critical review of previous investigations of this and closely related problems. The contribution of these to the question as a whole should be made clear, together with the fact that the investigation arises from fallacies, inadequacies or inaccuracies of earlier studies.
- A statement of the sources of data, the method of procedure (experimental techniques) and the treatment of the findings. In a classic thesis of an experimental nature, a separate chapter (Materials and Methods or Experimental Section) is ordinarily devoted to these topics. Where in the thesis this chapter appears is discipline-dependent and candidates should consult their supervisors on this matter.

2.2.2 Central chapters

It is impossible to give specific directions for organising the findings of all studies, because of the wide variety of topics investigated, techniques employed, and kinds of data accumulated. Suffice it to say that the chapters of this portion of the thesis are the thesis – they are the candidate's contribution to knowledge. All other portions of the thesis are subordinate to what actually has been discovered and is being made known in the thesis. The candidate should, therefore, take great pains to present their material in a clear and orderly fashion, in terms that will be readily understood.

The organisation and distribution of content should be such that each chapter represents an important division of the subject investigated and reported. Each chapter, other than the introductory, final and methods chapters, can be considered as standalone scientific manuscripts. As such they comprise:

- A contextualised introduction which also provides a statement of the portion of the overall problem;
- A description of the materials and methods used in connection with this part of the overall investigation;
- A description of the collected data;
- A discussion contextualising the information with the published literature; and
- A concluding section/summary indicating the contribution of the findings.

Thus, in many cases, the central chapters represent a series of publications. Indeed, this format is often referred to as a 'Thesis by Publication' (see 2.2.5). The central chapters will be arranged differently if the thesis is submitted in 'classic' or 'monograph' format.

NB: For PhD candidates, at least one publication must be submitted to a peer-reviewed journal before submission of the thesis for examination.

2.2.3 Concluding chapter(s)

The concluding chapter, or chapters, should be a summary, restating the developments of the previous chapters and showing the more important findings and conclusions of the whole study. It is here that the author is showing how their findings fit into what is known about the topic and how they are advancing understanding of the topic. Obviously, the summary sections/conclusions of each of the central chapters/publications form the basis of this concluding chapter. The author may also list unanswered questions that can be the basis of future studies. It is not unusual that synthesis of the introductory chapter and concluding chapter results in a review (or mini review) manuscript for publication.

2.2.4 Appendices

Appendices may also contain supplementary datasets, statistical analyses, code, additional figures, supporting images, technical documentation and other material that supports, but is not essential to understanding, the main argument. Appendices are convenient places for recording complicated mathematical or other formulae, descriptions of experiments or apparatus, and any other specialised or lengthy material such as computer programme listings,

copies of spectra or other instrumental outputs that would otherwise detract from the readability of the text. The reader should be able to study or refer to these later, and only if they wish to do so, after they have read the main work. Appendices must be numbered or lettered consecutively in large print at the top right-hand corner of the page to facilitate their location in the text. Each appendix must start on a new page. The appendices should be placed immediately before the list of references.

2.2.5 Variations in thesis structure

As previously mentioned, a PhD thesis may be submitted for examination in 'classic' format or via 'publication'. It is important to realise that there is acceptable variation between these two styles. For example, a PhD may be submitted for examination with one or two papers already published and a few other chapters that will form the basis for future publications (i.e. after/during examination). Other than the Faculty's basic rule that at least one manuscript has been submitted for peer review before examination, these variations in the PhD structure are acceptable and can be submitted for examination. The ultimate number of publications that emanate from a PhD will vary depending on the subject matter and the broader area of study. Students are encouraged to discuss the research outputs from the degree with their supervisor(s) from the start of their registration.

If a thesis which includes publications is to be submitted for examination, there are a few points that should be taken into consideration whilst preparing the thesis:
Any PhD must make (through research work) an original (novel) and significant contribution to knowledge in the chosen field. Thus, the thesis should contextualise the research in an overarching introduction, critically set the collected data in the context of existing literature and should evaluate the contribution that the research makes to the advancement of the research area. A thesis which involves a series of publications must clearly do the same. However, this demands taking into account the fact that each published paper has its own introduction, methodology, results and discussion sections. Candidates incorporating published papers into a thesis must also comply with the copyright and permissions requirements in Section 8.1.

It is therefore highly likely that there will be repetition of information in a thesis that includes publications. It is important to try to keep this to a minimum. This could be achieved for instance by reducing information in the contextualising introduction and presenting it in the introduction of the paper/chapter.

The writing of the concluding chapter for the thesis is made easier by the fact that each published paper has a conclusion. However, whilst drawing the publications/chapters together and critically appraising them in the coherent and synthesising concluding section of the thesis, it is important to remember to demonstrate how all of the research is advancing understanding in the field of study.

In the case of multi-authored papers, it is essential that the role played by each author is highlighted in an unambiguous statement. This statement can be placed at the start or end of the chapter/publication in the thesis and should include the details of the publication viz. title, journal name, page numbers, impact factor and must also allocate a percentage involvement of each author and describe their actual contribution. For example:

Tshabalala, T., Simatale, P. and Radebe, P. (2015) Rain in Gauteng South Africa falls mainly over Johannesburg. African Journal of Rainfall Patterns 18, 9–20. Impact factor 1.3.

Tshabalala – 60% (conducted the research, wrote the manuscript);
Simatale 15% (assisted with statistical analyses and their interpretation);
Radebe 25% (supervisor, original idea, funded the research and reviewed the manuscript).

Where a thesis incorporates co-authored publications, the candidate must clearly describe their own contribution to each publication and distinguish it from the contributions of other authors. Contributions may be described in prose, by percentage, or using an established contributor-role taxonomy such as the Contributor Roles Taxonomy (CRediT), where appropriate to the discipline and publication. The statement should accurately reflect the contributions made and should be consistent with the publication record and any applicable journal requirements. The candidate should consult their supervisor where clarification is needed.

Advisably the statement should be certified by all authors concerned.

Alternatively, early on in the thesis (e.g. after the abstract) an additional section entitled 'structure and outputs of the thesis' can be included in the thesis. This section should explain the structure of the thesis and can list the research outputs for each chapter (conference presentations and publications) and also provide the details of the involvement of each of the authors (as above).

In any thesis, it is essential to establish and retain coherence in the information (story) that is being presented. When a series of published papers are being linked into a thesis, the coherence becomes particularly important. For instance,

the conclusion of one published paper may not directly link to the introduction of the following paper in the thesis. In such a case, it would be necessary (and is therefore acceptable) to insert a written discussion leading the reader to the next set of information (paper/chapter).

Different journals have different formatting for the manuscripts; therefore, the different papers within the thesis may have different formats. This is not a problem. However, changing all of the chapters/papers to the same format can add to the overall style and appearance of the thesis. On the other hand, presenting the thesis with different formats can emphasise the fact that the work is already published. It is therefore recommended that this point be discussed with the supervisor.

2.3 References and bibliography

References should be chosen and cited to:

- Indicate the source of the writer's statements;
- Acknowledge another person's work; and
- Provide a source of additional information.

The relevance of any reference should be carefully considered and the number of references kept to a necessary minimum. All references appear together at the end of the publication. The citations must be given in sufficient detail for easy retrieval of the information.

2.3.1 Referencing systems

There are a number of different referencing systems. Candidates should follow the citation and reference style prescribed by their School or disciplinary norms, in consultation with their supervisors. The two most commonly used in scientific literature are the Harvard system and the Numerical system. You should note that styles for citations vary tremendously from discipline to discipline, and that not all the points mentioned (e.g. title of paper, or inclusive pagination) may be necessary. The examples below are illustrative only. Candidates should follow the style required by their discipline.

Harvard systems
The references are referred to in the text by the author's surname followed by the year of publication (in parentheses) and are listed in alphabetical order by year of publication in the list of references. If the same author is cited more than once for a given year the letters *a,b,c* are used to distinguish the articles. If their citation is only to a particular page then this is shown by the use of a colon followed by page numbers (after the date).

If there are more than three authors, only the first (senior) author's name is given in the text followed by 'et al.' Note the recommended layout of the reference list.

Specimen text
A succinct account of the basics of interactive television programming has recently been given (Bolton, 1981). Nyhan and Johnson (1980: 399) have summarised the economic implications. Robertson (1979) has reviewed some of the technical aspects. Veith (1981a, 1981b) has provided the best all-round accounts of teletext and videotext.

REFERENCES

Bolton, W.T. (1981) A lesson in interactive television programming, Journal of Library Automation, vol.14, no.2, pp.103-108.

Nyhan,M.J. and Johnson, P. (1980) Videotext and teletext in the United States, Telecommunication Journal, vol. 46, no.6, pp. 396-400.

Robertson, A. (1979) Teletext and viewdata, In: Johnson, P. ed. Television to Home Computer, Poole: Blandford Press, pp. 119-145.

Veith, R.H. (1981a) Teletext, Urbana: University of Illinois, 1981.

Veith, R.H. (1981b) Videotext, Urbana: University of Illinois, 1981.

The style used in the abovementioned citations is based on ISO 690, International Organization for Standardization (1984).

Numerical system
The references are numbered in ascending order in the text, and are listed in that order in the list of references. In the text itself, the numerals are typed slightly above the list of the text.

Specimen text
Bolton[1] has given a succinct account of the basis of interactive television programming. Nyham and Johnson[2] have summarised the economic implications. Roberton[3] has reviewed some of the technical aspects. Veith[4,5] has provided the best all-round accounts of teletext and videotext.

REFERENCES

1. Bolton, W.T. A lesson in interactive television programming, Journal of Library Automation, vol. no 14.2, Feb. 1981, pp. 103-108.

2. Nyhan, M.J. and Johnson, R. Videotex and teletex in the United States, Telecommunication Journal, vol., no 46. 6, Mar. 1980, pp. 396-400.

1. Robertson, A. Teletext and viewdata, In: Johnson, P. ed. Television to Home Computer, Poole: Blandford Press, 1979, pp. 119-145.

4. Veith, R.H. Teletext, Urbana: University of Illinois, 1981.

5. Veith, R.H. Videotext, Urbana: University of Illinois, 1981.

The style used in the above-mentioned citations is based on ISO 690, International Organization for Standardization (1984).

2.3.2 Citations

The order in which items in the references are listed is as follows:

- Authors' names
- Titles of articles, books, reports, theses or dissertations
- Edition numbers of books or report numbers
- Location of publisher (in the case of a book)
- Name of journal, publisher, conference, sponsor or report or the word Transactions or Proceedings followed by name of report
- Location of journal, conference, sponsor or society if not well known
- Volume number, issue number, month (abbreviated) and year of journal article or report. Year of book, Theses or dissertation
- Inclusive page numbers of journal articles.

2.3.3 Punctuation guidelines

- A comma is inserted after the author's surname, but full stops are inserted after the author's initial(s)
- Names of journals are written in full unless the abbreviation is accepted practice in the relevant discipline
- Titles of books, reports, Theses, specifications and journals are capitalised; those of articles submitted to journals and conference transactions and proceedings have the first word only capitalised
- Titles of books and journals are either typed in italics, typed in bold print or underlined

2.3.4 Examples of citation for different types of publication

Journal article:
Del Sasso, L.A., Bey, L.G., and Renzel, D. Low-scale C-flight ballistic measurements of guided missiles, Journal of the Aeronautical Sciences, vol. 15, no. 10, Oct. 1058, pp. 605-68.

Book:
Brook, E. Using Compilers to Build Compilers, Santa Monica: Systems Development Corp, 1960, pp. 1-3. (Systems Publication, 176).

Transactions or Proceedings:
Brutsaert, W. Some methods of calculating unsaturated permeability, Transactions ASCE, vol. 49, no. 3, Nov. 1953, pp. 400-405.

Theses or Dissertation:
Patton, F.D. Multiple Modes of Shear Failure in Rock and Related Materials, PhD Theses, University of Illinois, Urbana, III, 1966.

Conference reference:
Pecknold, D.A.W. and Sozen, M.A. Calculated inelastic structural response to uniaxial and biaxial earthquake motions, Proceedings of the International Association for Earthquake Engineering Fifth World Conference on Earthquake Engineering, Rome Jun. 1973.

Discussions or Closures:
Bell, J.M. Discussion of Dimensional parameters for homogenous earth slopes by Jamieson, A.R. Journal of the Soil Mechanics and Foundation Division, ASCE, vol. 94, no.SM3, May 7 1968, pp. 763-766.

Specification or Code of Practice:
British Standards Institutions, Specification for the Use of Structural Steel in Buildings, London: British Standards Institution (1969) (BS 449 Part 2).

2.3.5 Bibliography
Any supplementary literature not referred to in the text, but considered to be relevant and of interest, may be put after the references in a Bibliography.

3 HEADINGS AND NUMBERING
The arrangement of headings of various levels (hierarchical positions) reflects the organisation of the contents of the thesis.

The levels of headings may be indicated by typeface and format alone. For example, the heading **'TWO-PHASE FLOW'** is recognisably of a higher level than **'Onset of flow instability'.**

The numbering of such headings further clarifies the importance, sequence and interrelation of the portions of text under each heading. Thus, the headings **'2 TWO-PHASE FLOW'** AND **'2.3.3 Onset of flow instability'** are more informative than those in the example above.

Numbering also facilitates cross-referencing within the text: compare the economy of '…see 2.3.3 …' with '… see **Onset of flow instability** in the **TWO-PHASE FLOW**…'.

3.1 Rules for numbering
The recommendations given below are compatible with the International Standard ISO 2145 (1978).

- First level headings (usually chapter headings) of a thesis are numbered continuously beginning with '1'.
- Each main division of text (chapter) may be divided into any reasonable number of subdivisions, having second level headings which are also continuously numbered. This method of division and numbering can, in principle, be continued to any level, but tends to become clumsy and confusing at the fourth level and beyond.
- Numbering should thus be confined to the first three levels. Further (unnumbered) levels of headings may be identified by typeface and format (see 3.2).
- The numbers designating headings of different levels are separated by full stops (the present document serves as an example). No full stop appears after the last number; if only one number (that of a first level heading) is present (thus, **'2 TWO-PHASE FLOW'** and not **'2. TWO-PHASE FLOW'**)

3.2 Typeface and format
The typeface and format of all headings should reflect their levels, independently of numbering. The typographical details of the system of headings will be dictated largely by the printing system that is used in final production of the thesis. Whatever the typography, it is essential that the system be logical and that it be applied consistently.

Modern practice favours left-hand-justified, rather than centred headings. Note also, that no full stop appears at the end of a heading.

3.3 Examples of systems of headings
1 FIRST LEVEL HEADING (Bold) or CHAPTER 1 (Bold)

1.1 Second Level Heading (Bold)

1.1.1 Third level heading (Bold)

Fourth level heading (Bold and/ or Italics)

Fifth level heading (Bold and/ or Italics). This leads into the text on the same line.

4 STYLE AND PUNCTUATION

Style implies choice. However, in technical writing there are also constraints which limit choice. The following are some points which must be considered in thesis writing.

4.1 Text structure

A good thesis should be comprehensive and precise. The author should take care to present their arguments concisely. The author should proofread their draft carefully and critically, being mindful to eliminate unnecessary material. Should the author have trouble in presenting their thesis in English, they should seek help in this draft-reading process.

The following are some of the techniques that will help:

- Break down complex statements into lists;
- Use the active voice where appropriate;
- Do not use pompous words or jargon where simpler words are as effective;
- Avoid empty phrases such as 'it is interesting to note that…'; and
- Avoid unnecessary words, e.g. 'the precipitate was found to be in a wet condition' which means simply that 'the precipitate was wet'.

4.1.1 Word choice

Use of the personal pronoun

The argument against using personal pronouns in theses is that the subject matter is the important thing and the author is not. However, should this lead to vagueness in phrases like 'it is considered' or to ponderous writing like 'the author is of the opinion', then it is better to use a personal pronoun, e.g. 'I consider' or 'I think'.

Technical language and jargon

Technical language is a necessary part of scientific writing. The writers must, however, be certain that their audience will understand the language they use. Where there is doubt, they should define their terms, either in the text or in a glossary.

For example, 'The hydrostatic loss appears to be responsible for dumping (or weeping) from sieve places…' is acceptable in a thesis intended for readers familiar with distillation terms and concepts, but the statement becomes mere jargon where the potential readers may not be experts in the field.

4.1.2 Tenses

A guide like this cannot cover the ramifications of the uses of tenses in thesis writing. The following points may help, however, to avoid the more common errors:

- Reports of work done are usually written in the past tense;
- Universal truths, such as natural laws, are generally stated in the present tense;
- Do not change tenses in a sentence unless there is good reason for it. For example, if we say, 'the balloon rose because the hydrogen inside it was lighter than air', we may mean that this might apply only under the observed conditions; or we may mean that the gas used is inherently lighter than air. To make the meaning clear we must mix tenses within the sentence, eg 'the balloon rose because hydrogen is less dense than air'. But complications arise when tenses are changed without the writer having had a specific intention in mind.

4.1.3 Sentence structure

Active and passive voice

Traditionally technical writers have regarded the passive voice as the only acceptable form of presentation. In modern writing, however, the active voice is used far more often. Phrases like 'Economy justifies the procedure', are preferred to 'the procedure may be justified in the interest of economy'.

Sentence length

Long sentences with a number of dependent clauses are difficult to follow, particularly if the subject itself is complex. Reading tests have shown that sentences with more than 25 words are generally difficult to comprehend.

4.1.4 Paragraphing

Effective paragraphs typically begin with a topic sentence that introduces the central idea of the paragraph. Paragraphs are there to help the reader. They do so by breaking up the text into manageable sections. This objective is often not achieved because of poor paragraph construction. The following guidelines will assist in organising paragraphs:

- A paragraph should consist of a central statement supported by a group of details;
- In technical writing the main statement is usually at or near the beginning. For argument or persuasion, however, the central statement is often placed at the end as a climax to the supporting details;
- The transition between paragraphs should be smooth, with some form of connecting link in the text; and
- Long unbroken sections of text are discouraging to the reader and therefore paragraphs should not be unduly long. If your writing has many paragraphs exceeding 100 words, you should examine it critically.

4.2 Conventions

4.2.1 Capitals

There is much confusion about the use of capitals and authorities differ considerably. The modern trend is to use capitals sparingly. The following are some general guidelines:

i. The first word in a sentence and in a direct quotation are capitalised; proper nouns are capitalised, and common nouns such as river and company are also capitalised when they form part of a name e.g. Amazon River; and
ii. Common nouns are capitalised when they are used with a number or letter to designate a specific thing, e.g. Laboratory D.

4.2.2 Acronyms

An acronym is a word formed from the initial letters of a name or by combining initial letters, or parts of a series of words, e.g. 'radar': RA(dio) D(etecting) A(nd) R(anging). Certain acronyms like, 'radar' have become dictionary words. In general, however, use acronyms sparingly and, when using them for the first time, spell them out. Where the acronym is not an accepted dictionary one it should be in capitals, e.g. NATO.

4.2.3 Spelling

In a language as complex as English, there is no simple set of rules. When in doubt (e.g. when to use 's' and when 'z') consult the Shorter Oxford English Dictionary (1973), which gives the accepted standard English spelling (preferred to the American) or Oxford Dictionary for Writers and Editors (1981). Students should consult the Oxford English Dictionary or other discipline-appropriate reference works.

4.2.4 Abbreviations

Use only generally accepted abbreviations and symbols.

4.2.5 Punctuation

There are some 36 chief marks of punctuation. However, many of these are used only in specialised linguistic contexts and all should be used sparingly. For a concise guide to the use of the more common punctuation marks see Houp and Pearsall (1984).

4.2.6 Pagination

Pagination (page numbering) should run consecutively through the thesis with all pages (including figures, tables, numbered, etc).

5 NON-VERBAL MATERIAL

The customary medium of communication is language. However, in the sciences and engineering, extra-linguistic material such as numbers, symbols, mathematics, tables, graphs and illustrations of various kinds are frequently used. A cardinal principle for such material is that it should be used only when it is the most effective means of communication and understandable to the target audience.

5.1 Numerals

The rules for the correct use of numbers are simple and are mainly based on common sense. In the text, use words rather than numerals below ten. Exceptions to this rule occur in illustrations and tables, or when integers are associated with unit symbols. For numerals above ten, use whatever provides optimal clarity and appearance:

- Where it is necessary to have decimal fractions, these should be expressed in numerals, e.g. 'the original design required 2.7 times as many components as were finally used'. Do not begin a sentence with a numeral. This can lead to confusion and is in any event displeasing to the eye;
- Ordinals from 'first' to 'tenth' should be written out. For higher ordinals the author should once again use their discretion; and
- Avoid writing out large and small numbers by using either accepted prefixes or exponential notation, e.g. 253 x 10^3 or 0.253 x 10^6. Where large numbers must be written out, these should be separated by a small space into groups of three, counting from the left or right of the decimal sign, e.g. 5 241.2. For numbers less than unity, a zero should precede the decimal sign, e.g. 0.352. When listing numbers – as in a table – always align

them on the decimal sign. In South Africa, the decimal comma was initially used instead of the decimal point, but common practice is now a point.

5.2 Mathematics

Mathematics included in a text should form an integral part of the argument and should be intelligible to the intended readers.

Mathematics must be carefully presented – computer software can now generally provide all mathematical notation needed. The units and symbols used should be consistent and follow international practice as detailed in British Standards Institution (2010) or International Organization for Standardization (2010). Where AI-assisted code or computational methods form part of the research, the candidate should follow the documentation requirements in Section 2.1.2.

The form of presentation of a mathematical expression should be such that it:

- Brings out clearly the structure of the expression and
- Is as simple as possible to type

To comply with the last two points, algebraic fractions in the text should make use of a solidus and not a horizontal bar. Thus write $(ax+b)/(cx+d)$ and not $\frac{ax+b}{cx+d}$. However, note that careless use of the solidus can lead to ambiguities. Thus $a+b/y$ means $a+\frac{b}{y}$ and not $\frac{a+b}{y}$. Such ambiguities can generally be overcome by the use of parentheses, as in $(a+b)/y$, $\log(a/b)$ and $\sqrt{(3x)}$. Be sure that all parentheses and brackets occur in pairs. Exponential expressions should be set up as $e^{2nx/3y}$ or $exp(2nx/3y)$ rather than as $e^{\frac{2nx}{3y}}$. However, with more complicated expressions the foregoing rules may violate the conditions above. It may then be necessary to simplify the expression or set it out on a line all to itself. For example:

$$q = \frac{L(t_o - t_3)}{\frac{1}{2nr_1h_1} + \frac{1}{2nk}\ln\left(\frac{r_2}{r_1}\right) + \frac{1}{2nr_2h_2}}$$

can be set out as:

$$q = L(t_o - t_3)/R,$$

where,

$$R = \frac{1}{2nr_1h_1} + \frac{1}{2nk}\ln\left(\frac{r_2}{r_1}\right) + \frac{1}{2nr_2h_2}.$$

Modern practice favours central justification on all equations, as shown above, rather than vertical alignment of equal signs. Where the right hand side of an equation is too long to fit on one line, a break should be made before an operational sign (eg + or -) or at some other logical point, but preferably not within a bracketed statement. The next line, starting with an operational sign, should then be placed just to the right of the equal sign. It may, however, not always be possible to avoid breaking a statement within a bracket. In this case the above rule should be observed as far as possible, as illustrated in the following example:

$$\Delta\omega = (1/y)\left[\int F(v_1A_1)\phi_1\phi_2 dV + \int F(v_1A_2)\phi_1\phi_2 dV + \int F(v_2A_1)\phi_1\phi_2 dV - \int F(v_2A_2)\phi_1\phi_2 dV\right]$$

where,

$$y = \int (\phi_1\phi_1 + \phi_1\phi_2) dV$$

Particular care is required in the use of subscripts and superscripts. They should be placed next to the main symbol and half a space below or above it respectively. Where both are used they must line up vertically,

i.e., A_s^2 not $A_s{}^2$. Thus, e^{x^2} should become $exp(x^2)$ and E_{1_a} becomes $E_{1,a}$. Periods are generally omitted in abbreviations, e.g. T_{max} not $T_{max.}$

Standard symbols should be used wherever possible and the recognised literature in the field consulted for references to these.

LaTeX is convenient for preparing mathematical type for theses, dissertations and research reports.

5.3 Tables

Tables are best used when data cannot be clearly presented in graphical form. Tables may also be used to summarise large volumes of descriptive, comparative or observational data. For example, discrete data sets can frequently be compared more effectively by using a bar chart than a table. In one sense a table is a form of graphical presentation. As such it should be kept simple and clear. Only relevant information of conclusions should be included. There is no need to put in all intermediate steps or results – they only cloud the main issue.

Tables can be arranged either vertically or horizontally. Vertical tables are those which can be read when a page is in the normal position. Clearly they are the most convenient to read. Where possible they should be arranged to fit into a single page of the document. Horizontal tables are used where their size is such that they cannot be fitted into the width of the printed page.

Each table should have a heading and be numbered with Arabic numerals. Tables in theses should be numbered as follows:

- Firstly, by the number of the main text division (chapter) in which they occur.
- Secondly, by Arabic numerals running consecutively through that text division.

The two numbers are separated by a full stop. Thus, the first table in Chapter 2 is **Table 2.1**, the second table in Chapter 2 is **Table 2.2** etc. The same principle holds for lettered appendices, but the full stop is omitted. Thus, the third table in Appendix E is **Table E3**. Tables should be referred to in the text by means of the table number.

Tables in papers for journal publication are numbered (without reference to the main text division) consecutively with Arabic numerals throughout the text. The columns in a table should be arranged for easy comparison, related information being brought together. Each column should carry a brief heading and include consistent units where relevant. The same symbols, units, and abbreviations should be used in the text. Table 5.1 illustrates some of these rules.

Table 5.1 Calibration of rotameter

Position of Float (mm)	Flow rate (m^3/h)	
	T_L = 17°C	T_L = 120°C
100	0,451	0,425
200	0,736	0,720
300	1,027	1,015
400	1,348	1,342
500	1,656	1,672

In column headings avoid using expressions like $x10^{-3}$ as these are ambiguous. It is not clear whether the figures in the column have already been multiplied by 10^{-3}. Rather use the recognised metric prefixes, e.g. 'mm'. Where this is not possible, make sure the heading is unambiguous even if it appears clumsy. For example, use 'Capital cost:Rm' rather than '$x10^6$ = Capital cost in R'.

5.4 Illustrations

Raster images included in a thesis should normally be prepared at a minimum resolution of 300 dpi for print reproduction. Images intended primarily for electronic viewing should be of sufficient resolution to remain clear when viewed at normal magnification. Text appearing within figures should remain clearly legible at the final reproduced size. All illustrations (graphs, photographs, drawings and diagrams) are referred to as **Figures.** Each has a number and a descriptive title which should be placed below the illustration. Numbering follows the same principles as those

for tables (see 5.3). Thus, the first figure in Chapter 2 is **Figure 2.1,** the second **Figure 2.2** etc. The third figure in Appendix E is **Figure E3.**

Figures in papers for journal publication are numbered consecutively with Arabic numerals throughout the text. Only figures essential to the methods, interpretation or argument should appear in the main text. Supplementary figures should normally be placed in appendices.

5.4.1 Graphs

3D-graphs can take on a number of different forms, e.g. bar charts, divided circles, pictographs, or line graphs. The appearance of a graph is its major attribute. It is, therefore, up to the writers in choosing one of these forms, to decide on the impression they wish to convey. As line graphs are most frequently used in scientific and technical work, attention here will be directed primarily to this type. Line graphs are mainly used to show the relationship between a continuously varying independent variable and one or more of its dependent variables. Wherever possible use should be restricted to this purpose. In preparing graphs for inclusion in a thesis the following should be borne in mind:

- The graphs should illustrate clearly the point which the writer wishes to make;
- The scale chosen should be such that only the relevant parts of the curve are presented, that is, the grid should not be extended unnecessarily beyond the limits of the curve to be shown;
- If it is necessary to suppress the zero this should be clearly shown;
- The choice of grid size depends on the accuracy required;
- The scale should be easy to read and be restricted to multiples and submultiples of 10;
- Units should be clearly stated and written so that they can be read easily;
- The caption should be brief but self-explanatory and be positioned underneath the graph; any notes or supporting documents, if necessary should be placed below the title; and
- To ensure clear reproduction graphs should not be overburdened with detail.

Fig 5.1 is an example of a good graph

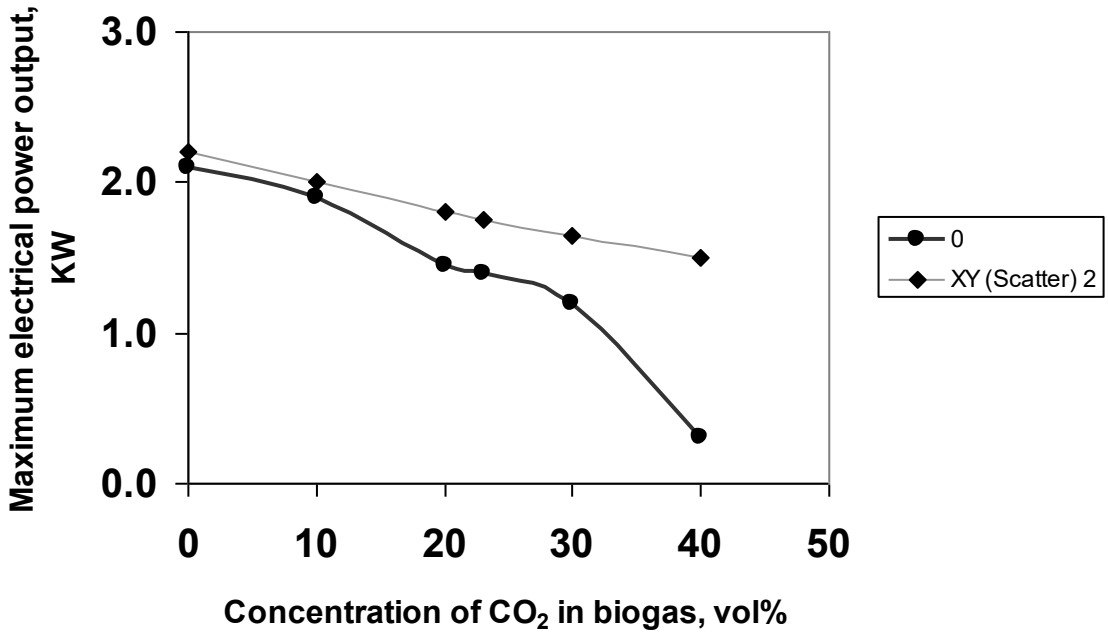

Figure 5.1 Effect of carbon dioxide concentration in biogas on power output

The lines should usually be at lease 1mm thick and number or figures should not be too small.

5.4.2 Drawings, diagrams and photographs

Line drawings and diagrams are made up of lines, words and a few special symbols. They must, as far as possible, be simple and uncluttered with detail: working drawings are normally not acceptable. Unless they serve to clarify the verbal content of the report, or express an idea more vividly than words can, drawings or diagrams serve no purpose. Only generally accepted graphic symbols should be used.

The inclusion of photographs may occasionally prove useful and sometimes even necessary. If they are to be used they should be taken with care. Cluttered backgrounds and views of unrelated equipment should be avoided. Adequate contrast should be provided, and care taken so that important details do not fall into shadows or become obscured by

the glare of highlights. Some sort of scale should be included so that the size of the object is reflected. Lettering on prints may be necessary, but care should be taken to ensure that the letters stand out.

Any illustrative material which cannot effectively be reduced to A4 format, but which is relevant may be included in a pocket on the inside back cover of the thesis or included as foldouts.

6 PRODUCTION OF THE THESIS

6.1 Type layout

Theses may be prepared using Microsoft Word, LaTeX, or other suitable document preparation systems. LaTeX is particularly useful for documents containing mathematical notation, extensive cross-referencing, bibliographies, figures, tables and code listings. Where AI-assisted code or computational methods form part of the research, the candidate should follow the documentation requirements in Section 2.1.2. A thesis should be typed. A clear font such as Arial or Times New Roman should be used. Italic script or other unusual type faces should generally be avoided unless they are necessary. A font size 10 or 12 should be used. The font colour must be black.

The main body of the text should be typed in one or one and a half line spacing and generous margins should be allowed. Typed pages should be aligned at a constant distance from the top and bottom of the page, although the top margin of the first page of a chapter may be lowered slightly. (A specimen page layout is shown in Appendix E.)

The following are suggested dimensions of margins:
Top, bottom and right: 30 mm
Left: 40 mm

Text should be formatted consistently throughout the thesis, dissertation or research report. Left-aligned text is recommended; full justification may be used where appropriate, provided that spacing between words remains even and the text is easy to read. Paragraphs should be distinguished consistently, either by spacing between paragraphs or by first-line indentation. Candidates should avoid combining indentation and additional paragraph spacing in a way that makes the document difficult to follow. The chosen format should be applied consistently throughout the document, except where a different layout is required for specific elements such as quotations, tables, references or appendices.

Candidates should prepare the thesis, dissertation or research report for clear and reliable electronic viewing and reproduction. The final document must be submitted in the file format and through the procedure specified by the Faculty at the time of submission. Unless otherwise instructed, the submitted document should be a complete, searchable PDF with legible text, correctly rendered equations, embedded or appropriately preserved fonts, and figures and tables of sufficient resolution for electronic viewing and printing.

Candidates should check that the contents page, lists of figures and tables, page numbering, bookmarks where appropriate, and internal cross-references correspond to the final document. Any required declarations, forms, permissions and supplementary files must be provided in accordance with current Faculty procedures.

Physical printing, binding or the provision of hard copies is required only where specified by current University or Faculty regulations. Candidates should consult the current postgraduate submission instructions rather than relying on this guide for administrative deadlines or file-transfer procedures.

6.2 Illustrations

Illustrations form a very important part of a thesis and should be carefully prepared. Whatever method of reproduction is to be used for their presentation in the thesis, the essential requirements are that a table or illustration should be neat, concise, legible and, above all, comprehensible. Originals of photographs are not necessarily required but it is essential that any reproduction of a photograph is clear. Figures should be assessed at their intended display size to ensure that labels, symbols, legends and other essential details remain legible in the electronic document and, where applicable, in printed copies.

7 EDITING AND REVISING

7.1 Checking, rectifying and polishing

Editing the first draft is the authors' responsibility; they cannot expect their supervisors or any outside person to:

- determine the accuracy of the information;
- clarify ambiguities;
- emphasize important issues; and
- check spelling.

The editing process is essentially one of critical evaluation of the manuscript against the requirements set by the objectives of the research. The main requirements are those of content, or orientation to the reader and of accuracy, brevity and clarity in the functional writing style. The author should evaluate each chapter of their thesis and check whether it:

- Has real content;
- Is free from inaccuracies, ambiguities and bias;
- Emphasises important issues and is free from verbosity, irrelevances and unnecessary detail;
- Can be understood readily; and
- Is appropriate to the situation.

Before starting the process of checking, rearranging and polishing, the writers should preferably leave their draft for a few days so that they can mentally switch to the role of a critical reader.

The editing consists of three operations which should be done separately. These are:

- The integrity edit;
- The logical progression edit; and
- The text and language edit.

7.1.1 Integrity edit

The contents page should be examined and the following points checked:

- Are the headings and subheadings clear descriptions of what is covered?
- Do they form a recognisable logical pattern and is the numbering system used a reflection of this pattern?
- Are the headings grammatically parallel?

Next the text should be checked page by page for the following:

- Are the headings and numbers identical to those used in the list of contents?
- Are the tables and figures properly numbered and in sequence, and do they have informative headings and captions?
- Are tables, figures and references correctly cited in the text?

7.1.2 Logical progression edit

Each chapter should be read as rapidly as possible to:

- Check that the objective is clearly stated and that the concluding section shows whether or not the objective was achieved;
- Check that the logical thread is apparent; any jumps or gaps in the progression are usually an indication of faulty organisation; mark these, but do not correct at this stage; and
- Check, in particular, whether sections contain anything which does not belong there.

The conclusions list should arise from the discussion. Structural defects must be corrected before the text and language edit.

7.1.3 Text and language edit

Only when one is satisfied with the basic format of the report should one concentrate on the structure of the text and the use of language. The text may include non-verbal components such as graphs and illustrations. These should be evaluated as part of the text. The criteria for evaluating functional writing, mentioned before are:

Content criteria

- Accuracy – sufficient for the needs of the audience;
- Brevity – leaving out irrelevancies and at the same time covering the essentials adequately;
- Clarity – avoiding vagueness and ambiguity; and
- Emphasis – drawing attention to significant information

Tonal or attitudinal criteria

- appropriate to the situation;
- concern for the needs of the audience;
- serious treatment of subject matter; and
- authoritative without being writer-centred.

The specific aspects of language usage discussed in Section 4 should be consulted.

Students who require additional support with academic writing are encouraged to make use of the Wits Writing Centre and other University-supported writing programmes.

7.2 Graphic material

Essentially the same criteria used in the language edit, viz. accuracy, brevity, clarity and emphasis can be applied to graphic communications.

One of the main reasons for using graphics is their ability to give an overall view and show relationships. Any graphic material which fails in these important areas probably does not justify the extra effort of using it.

7.3 Time and space separations

Most theses are prepared for consideration within a short time and often for a local audience. However, once accepted, a thesis becomes part of the body of scientific literature. Writers should therefore draw attention to information that is only valid for a short time. The writer should be aware that points which are valid locally (e.g. under Highveld conditions, an altitude of about 1500m) are not necessarily valid generally. For instance, a recommendation to install solar heating panels on north facing roofs will not make sense in the northern hemisphere. Cost data are also subject to variation by place and in time, and the exchange rate and other relevant factors may have to be specified to make matters clear.

7.4 The external viewpoint

Authors may claim to be objective. Usually they are not – at least, not to the extent required for a good manuscript. Therefore the external readers' viewpoints are needed. This can be provided by supervisors or critical colleagues who do not have to be experts in the subject of the manuscript, but who must be able to place themselves in the position of the intended audience. They should be skilled in recognising the errors authors make and should annotate the manuscript accordingly and, in addition, suggest ways of improvement. The best manuscripts are produced by a co-operative interaction of authors, supervisors and independent editors.

7.5 Rewriting

Of all tasks, rewriting a text is the most unpopular, yet if we wish to develop a clear style it is usually essential. Editing tends to concentrate on the correction of errors rather than elegance of diction. Rewriting all or a substantial part of the text is usually the only way of getting an elegant well-balanced text.

7.6 Readability of texts

One of the main objectives of editing is to improve the readability of the text. The factors affecting readability have been extensively studied and various indices have been proposed. Most of these, however, were developed for school textbooks or general reading. Comparatively little work has been done on assessing their relevance to technical writing. For this reason readability measures should be used with caution in evaluating technical writing. This applies particularly where the index is given as a measure of reading age. In spite of this, readability measures have a role in comparing texts and are useful in placing them in a rank order of readability.

One of the simplest to use is the Gunning Fog Index. This measure depends on two factors, sentence length and the percentage of 'difficult' words. The procedure for calculating the Fog Index is as follows:

- Select a passage of about 100 words of continuous prose (avoid passages containing lists);
- Calculate the average number of words per sentence, ie average sentence length (l);
- Calculate the percentage (p) of difficult words. This is done by counting the number of words containing three or more syllables and expressing this number as a percentage of the total number of words in the passage. Three-syllable words ending in –ed or –es, words that are normally capitalised, and coupled short nouns (eg bookkeeper) are not counted;
- Calculate the fog index using formula; and
- Fog index = 0,4 (l + p)

Texts with an index below 10 may be staccato, while those above 16 may be unnecessarily difficult. It must be emphasized that the Fog Index is one of many criteria that can be used to evaluate texts. A skilled worker can produce readable long sentences while a poor writer can make a short sentence difficult to read.

7.7 Computer editing

Students are encouraged to use spelling, grammar, reference management and proofreading software. These include spelling and grammar checks, calculation of readability indices and the production of an index.

8. LAWS AND REGULATIONS

8.1 Copyright laws

Students must comply with current South African copyright legislation. Direct quotations from another work are permitted to a reasonable extent for the purposes of research provided that the source and name of the author are acknowledged. Subsequent publication of the thesis as a book necessitates the explicit approval of the copyright

holder for this purpose. In this connection, thesis writers should be aware also of University Rules and Regulations in the Faculty of Science Rules and Syllabus Book.

The thesis, dissertation or other work shall:

- Include an abstract of not more than 350 words for a doctoral thesis and not more than 150 words for a master's dissertation; and
- Conform as far as possible to the style and format recommended in the style guide for theses and dissertations.

Formal Declaration
Together with their thesis, dissertation or other work, the candidate shall submit a formal declaration stating whether:

- It is their own unaided work or, if they have been assisted, what assistance they have received;
- The substance or any part of it has been submitted in the past or is being or is to be submitted for the award of a degree at any other university: and
- The information used in the thesis, dissertation or research report has been obtained by them while employed by, or working under the aegis of, any person or organisation other than the university.

8.2 Copyright and theses incorporating published material

Candidates who incorporate published articles, book chapters, figures, tables, photographs or other third-party material into a thesis, dissertation or research report must ensure that the material may lawfully be reproduced in the submitted document and, where applicable, in the University's electronic repository.

Before submission, candidates must check the relevant publisher agreement and any applicable open-access license to establish whether permission is required. Where permission is required, written permission must be obtained from the relevant rights-holder and submitted with the thesis in accordance with current University procedures. The fact that a candidate authored or co-authored a publication does not necessarily mean that they retain the right to reproduce the publisher's version.

Where material is available under a Creative Commons or other open license, candidates must comply with the license conditions, including attribution and any restrictions on adaptation or commercial use. The applicable license must be checked rather than assuming that all open-access material may be reproduced without restriction.

Candidates should also consider copyright in third-party figures, tables and other material reproduced within an otherwise open-access article. Where permission is not available, the candidate should seek guidance on an appropriate alternative, such as replacing the material, creating an original figure, or providing a citation and link instead of reproducing it.

Candidates are responsible for ensuring that the necessary permissions are in place before submission. They should consult the University's current copyright guidance and seek advice from the relevant University copyright or scholarly communications service where necessary.

APPENDIX A

TEMPLATE TITLE PAGE

Title
by
Name and Surname
(Person number)

Title of document

Submitted in fulfilment of the requirements for the degree

Degree name

in

Field name

in the Faculty of Science, University of the Witwatersrand, Johannesburg, South Africa

Supervisor:
Co-supervisor:

Month year

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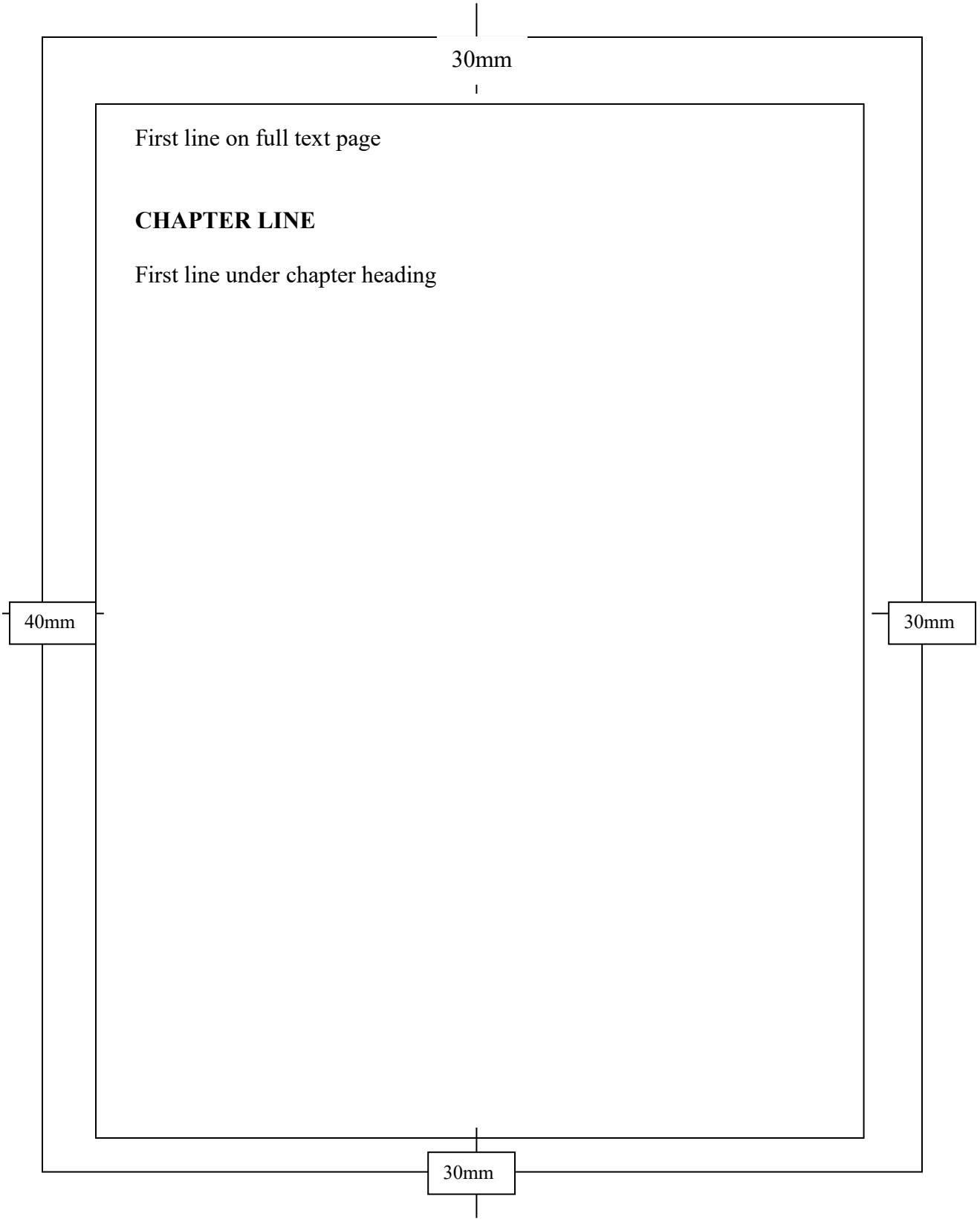
SPECIMEN PAGE LAYOUT



Outer line represents edge of paper and inner one typing area

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