



## Written Treatise Guidelines

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A *thesis* is normally 40,000 to 80,000 words while a *treatise* should not normally exceed 40,000 words. Also, the term *thesis* tends to be used for research-only degrees (such as Masters of Philosophy or PhD) or degrees that are predominantly research (such as Professional Doctorates). The term *treatise* tends to be used for part of a degree that is predominantly coursework but also has a research component [3].

That is why you are doing a treatise, NOT a thesis. Some documentation and some staff will occasionally refer to the unit and/or treatise as "thesis"; you know what they mean.

The details to follow are to be considered as a guide. If you are at all in doubt, you should discuss your queries with your supervisor to assess their preferences. Also, there are many books in the Library on writing a treatise or thesis. These are summarized (rather too briefly) in this list of [what is looked for in a treatise](#).

You are producing essentially a (small) book detailing your investigations into an engineering problem. It is the communication of the results of your work and your work is of no use if it is not communicated. It is to be written for an audience of your electrical-engineering colleagues, who are familiar with engineering concepts but not necessarily familiar with your project topic. Also, engineering is an on-going process: you build on what others have done, you make some progress on it yourself and then you hand your conclusions over for others to follow.

The treatise takes time to write, so should be started about the same time you start your work. You already know what the chapters will contain:

1. Introduction - what the problem is and why it is important,
2. Background - what other people have done before you,
3. Work - what you did,
4. Analysis - what were the results of what you did, and
5. Conclusions - your conclusions and suggestions for further work.

Treatises are to be printed single-sided and single-column, with 1.5 or double spacing, in 12-point typeface, on white, A4 paper, with margins of 2cm top, right and bottom and 3 cm left. Variations may be arranged in consultation with your supervisor. For instance, single-spacing is occasionally preferred to conserve paper and storage space.

The treatise must be bound; cloth or soft bound with card or plastic covers using Perfect or plastic-ring (spiral) binding. The treatise must be printed portrait with the binding on the left side (long side). If cloth binding is chosen, you must use boards covered with book cloth or buckram or other binding fabric. You are free to select a plain colour of your own choice for the binding fabric. Cloth binding is not mandatory, but you might prefer it after the hard work you have put in (your parent-figure might cherish this). The criterion is that it holds together when dropped from waist-height. An option is to do two copies in (fast) spiral binding while, off-line, you get one or two copies properly bound for yourself and others.

A treatise typically consists of 30--60 pages of words and diagrams, not including appendices, with the recommended formatting. Most satisfactory treatises contain 10,000 to 20,000 words. A picture (or a carefully scaled and labeled graph) is worth a thousand words! This assumes that the picture or graph is relevant.

Note that the first three pages are prescribed to be the Title page, the Compliance page and your Statement of Achievements page. The Title page should be unadulterated. Note that, in your one-page Statement of Achievements, your having *learnt something* is NOT considered an achievement. This learning needs to be applied in order to achieve a significant achievement. In the case of groupwork, it should also say what you yourself achieved and what the group as a whole achieved.

The next page can be an additional title page of your choosing, if you so desire. This is optional. It might, for instance, include your external supervisor and company logos.

An Abstract of 100--200 words, occupying a single page, follows the optional title page (if included). The abstract should clearly state the subject area, and what was achieved. If in doubt about what an abstract is, you are directed to a suitable recent journal for examples of abstracts.

If the treatise includes an acknowledgment, and/or a preface, these usually precede the table of contents (TOC). Each of these starts on a new page. The acknowledgement page usually thanks your parents, significant other, friends, cat/dog, chocolate or alcohol for keeping you going through the late nights that some students seem to need. You might even thank your supervisor for his/her help or lack thereof. The

preface page, if included, seeks to position the reader in a frame of mind suitable to appreciate the contents of the treatise (if you don't understand what this means, don't have a preface page).

A TOC is required. Don't list sub-sections and sub-sub-sections. It is best if the TOC is kept to a page.

A List of Figures, List of Tables and a Glossary of frequently-used acronyms are optional and depend on your particular treatise, *e.g.*, if it has a large number of diagrams, tables and/or acronyms. Each of these starts on a new page and comes after the TOC.

Pages prior to and including the TOC and Lists need not be numbered. (It is common to number the pages before and including the TOC and Lists in Roman numerals, and to number the treatise pages in Arabic numerals.) Page numbering is usually linear in the body of the treatise, that is, the chapters have their pages numbered in a single sequence, NOT in the form of `C.P', where C is the chapter number and P the number of the page within that chapter, starting again at 1 in each new chapter. However, both forms are acceptable. Numbering of pages in appendices usually reverts to the form `A.x' where the first character is a capital letter designating the appendix, starting with A, and the second character is the page number, which restarts at 1 in each new appendix.

A single Bibliography follows the appendices, rather than separately for each chapter. A Bibliography is sometimes called a Reference. The difference between these is real but obscure. The ultimate purpose of a bibliographic reference is that the reader can easily find the journal or book for themselves. Citations are made using Arabic numerals in square brackets, thus: [12], [13,14,19], or [9--11]. Harvard-style citations, such as (Smith, 1923) or (Jones 1985, Bloggs 2006) are not common in engineering documents. Where a cited reference is a journal, you must include author's names, the journal title should be in *Italics*, volume number, issue number, and page numbers should be included, and the date of publication, month and year, should be included. In the case of a textbook, the chapter or chapters should be given, along with title, author, publisher, year of publication, and edition (if not the first). Where the reference is a WWW page, both the URL and the date of access should be given. If you are in doubt of the proper format for a reference, refer to the various IEEE Transactions in the Library.

Build the bibliography as you go, using software tools if desired. This is much easier than having to do it after the fact.

Readers will look to the Bibliography as an indication of how widely and deeply you have researched your topic. A mere couple of web references generally indicates very-poor research. A Wikipedia reference is generally regarded as a sure sign of an inadequate literature search. If you don't have access to IEEEExplore, you will not be able to do an adequate review of past work on the Internet. Even if you do, you will still have to visit the Library. A good bibliography generally has references varying from current work on the web to seminal books published maybe a century ago.

Content is hard to prescribe or proscribe, but some advice is offered. Put simply, a treatise should cover:

1. an identification of the problem, and why is it important,
2. the background and what others have done,
3. what you, the student, has done,
4. what results were obtained, and
5. your conclusions and your suggestions for further work.

When a treatise is marked, a commentary of no more than one page is normally kept by the marker to justify the mark returned. A marker will look to see that these matters have been addressed.

A review of previous work on the topic is expected. Without it, you are either doing a technician's job and/or are ignorant of work that other engineers have done. This is particularly true of software: you are not just writing a program, you are investigating a problem, so a review of that problem and the applicability/relevance of other attempts is important. Think of the broader concepts involved and try to bring the insights of other fields of study to your problem. For instance, a night-club doorman and a network print server are, at one level, just instances of a resource-allocation problem.

The most common, and probably the most efficient way to get up to speed on a topic is to read about what has been done before. Previous work is usually listed, and objectively criticised, in a review chapter. A reader expects the student to have done a literature search. The review chapter will (usually chronologically) identify relevant works, and so is normally rich in citations. The criticism of them sets the stage for the contribution of the work. For example, if the project is to build a better automotive ammeter, a review chapter might run;

In [9], Bloggs describes the construction of a moving-coil meter... In automotive applications, panel meters must be robust and able to withstand years of vibration and shock [10]. Consequently, an alternative meter movement that does not rely on delicate mechanical suspension components was developed [10,11] and adopted ... ..

Of course, some information, such as usage statistics and commercially-sensitive design parameters, will not be in the technical literature. In this case, to continue the same example, the following might be presented;

A drawback of most automotive ammeters is their linear scale. A nonlinear scale, showing meter deflection for small currents such as a map light inadvertently left on, as well as starting currents of the order of 100--200 Amperes, would seem desirable. A search of the

literature yielded some 40 potentially-relevant articles (refer to appendix B). After obtaining several of these references, no evidence of this idea appeared. A Web search and browsing of contemporary trade magazines [12-18] was carried out, to no avail. This depth of search was considered satisfactory evidence that no previous design has appeared.

In fact there is such a design, but the student would not be expected to find it since it is obscure; yet the above paragraph would satisfy any reasonable marker. If the marker knew a reference, and the matter had been skipped over by the author, a comment to the effect of 'the review missed articles and may have been inadequate' would justify low marks.

A treatise should clearly identify what work was actually carried out by the student. A fine-looking treatise could be constructed around material from the literature, by stating that 'a circuit was designed using common components...' without saying how much input was original. (In fact your treatise is required to have a 'statement of achievement' clearly listing original work. See the Treatise Requirements for more information.) However, markers accept that there is merit in properly using existing information and great merit in combining ideas to obtain useful results. To continue the ammeter example, a chapter introduction might read;

A nonlinear prototype ammeter was constructed, installed in the author's car, calibrated and tested. A standard logarithmic amplifier circuit from [19] and a current-sense circuit from [20] were modified by the author in consultation with her supervisor. They drive a hot-wire gauge using an original power-amplifier feedback circuit. The circuit is given in figure 12. Design data, including PCB layout, appears in Appendix C. Calibration was achieved by tapping the earth-return strap as described in [20], against an HP3458A DMM with 0.1% accuracy [21].

Figure 13 shows a plot of measured deflection against current on semilogarithmic scales ...  
...

Table 2 lists typical events observed in normal usage of the car, with observed meter deflections, tabulated against currents subsequently measured in the test car by technical staff in conjunction with the author ....

A treatise should have a succinct, factual conclusion. The conclusion summarises what has been learnt--what was not known or not proven before the work started, what works and what turned out to be difficult. It is also usual for the conclusion to be 'optimistic'. Even a negative result is good: it identifies difficulties, eliminates possibilities, etc. In this case the treatise should be a convincing indicator to later workers as to what difficulties are to be expected, or what avenues do not look promising, in order to prevent wasted effort in the future. Unfinished aspects of the treatise are usually placed in a separate section entitled 'future work'. Note that even a very successful treatise ought to point to future work (raising more questions than it answered). Again using the ammeter example we might expect;

Because few examples appear in the literature, several different designs of nonlinear ammeter were designed, built, and fully road-tested. They included analog, digital and discrete bar-graph displays, with centre-zero or signed polarity, and with hot-wire and moving-coil analog meters. It was found that a centre-zero, nonlinear ammeter was clearly the most useful for a car dashboard, but that the precision of the nonlinearity was not important. Although it proved uneconomical in the space of this treatise to use a hot-wire meter, since none was available that consumed no power when reading zero current, this might be the best alternative if the cost of manufacturing the meter was amortised over many units. Data logging was implemented using a commercial microprocessor development kit. Subsequent perusal of current-time data might have allowed battery charge and battery health to be estimated, but this proved to be too great a task to undertake in the scope of an undergraduate treatise. Table 7 lists the advantages (potential selling points) of the device over existing vehicle implementations.

#### FUTURE WORK

The economics of including such an instrument in production cars needs to be addressed. This will consequently involve investigating the advantages to be obtained from making wide dynamic-range current measurements available to vehicle management computers ...

A treatise may have many appendices. Details, particularly experimental procedures, original software source code or instructions for use, mechanical drawings, PCB layouts, tabulations of more-critical measurements, unusual design calculations, data sheets of central or rare components, *etc.*, should not appear in the body of a treatise, but may be important to replicating the conclusions. These form appendices. A marker may not read appendices in word-for-word detail, but will appreciate the presence of the important details. It is a good practice to enclose disks carrying original software, especially as later workers may want access to it.

In summary, you already know the structure of your treatise:

- Title Page
- Compliance sheet
- Statement of Achievements
- [optional title page]
- Abstract
- Acknowledgments
- [preface]
- Table of Contents

[List of Figures]  
[List of Tables]  
[Glossary]  
Chapter 1 Introduction  
Chapter 2 Background  
Chapter 3 Design  
Chapter 4 Analysis  
Chapter 5 Conclusion  
Appendices  
Bibliography

... .. or something similar.

Your supervisor may give you some past treatises as models to give you some ideas for good presentation of your treatise. Also, there are many books in the Library on writing a treatise.

Common deficiencies in a treatise are a lack of coherent thought through-out, an inability to discuss prior work on the problem, too narrow a fixation with the details of the instance of the problem, limited testing and a hastily-written conclusion. You are researching an engineering problem, not just doing a quick programming or circuit hack! See also [what is looked for in a treatise](#) and the [Project marking sheet](#).

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