**Layout and Structure of an Honours Project Thesis**

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1. Introduction

This paper gives some details about the layout and structure of a level 3 Project Thesis in the School of Engineering. It should be read in conjunction with the paper on how to write a thesis [1] and the handbook entry for EG-353.

2. Physical Layout Details

The thesis must be written in A4 paper, either single or double sided, double spaced, using 10-12 point font size (Times Roman or similar), minimum 1" left and right hand margins and top and bottom margins. The title page should follow the template provided in the Blackboard website for the course. The Thesis should not exceed 50 pages plus 10 pages for appendices. **You should bind together with the thesis the two page, two column extended abstract (follow the format of this paper), the original (un-amended) plan of work and the progress report submitted earlier through the year.** Include these items at then end of the thesis itself.

3. The structure

A thesis is made up of a number of chapters preceded by a number of fairly standard sections described below. Start each chapter in a new page and use as many sections and subsections as necessary. The list of chapter headings suggested below may be appropriate for some theses. The first and last three are fairly standard. The rest will be more specific to your project. Results and Discussion are often combined in one chapter. Think about the plan of chapters and decide what is best to report your work. Then make a list, in point form, of what will go into each chapter. Try to make this rather detailed, so that you end up with a list of points that corresponds to subsections or even to the paragraphs of your thesis. At this stage, think hard about the logic of the presentation: within chapters, it is often possible to present the ideas in different order, and not all arrangements will be equally easy to follow. Before the real chapters start, the following sections are usually included:

*Acknowledgements*

Usually included to recognize the contribution of the supervisor, the uncle, people in the school who have helped, (such as research students, technical support staff,) family support, typist, longsuffering wife/husband *etc.*

*Abstract*

Although it appears at the beginning of the thesis, this is best written **towards the end** of your labours, but not at the very last minute because you will probably need several drafts. It should be a distillation of the thesis: a concise description of the problem, your method of solving it, your results and conclusions – in other words, a mini-report designed to engage the interest of the reader and encourage him/her to read on. Managers will use an abstract or summary in a report to quickly decide on further action. An abstract must be self-contained. Usually it does not contain references or diagrams.

*Contents*

This section contains a list of contents, in sequence, by Section or Sub-section number and Heading together with page number.

*List of Figures and Tables*

This lists the figure numbers, captions and page numbers in the order in which they appear in the thesis.

*List of Symbols*

This list provides a key for the mathematical symbols, or notation, used with an explanation for each one. (Usually just one line per symbol)

The pages up to this point should be numbered with Roman Numerals: i, ii, iii, iv *etc.* These will not be included in the page count. Number the following pages up to and including the references with normal numbers, 1, 2, 3 *etc.* These pages will be included in the page count. Now the real chapter will start and will typically include some or all of those listed below.

*Introduction*

What is the problem and why is it important? Make the statement of the problem (or the objects and aims of the project) quite clear: and remember that you have been working on this project for a few months so you will be very close to it. Try to step back mentally and take a broader view of the problem. How does it fit into the wider world of engineering? Especially in the introduction, do not overestimate the reader's familiarity with your field. Engineering is pretty specialised and most of us are unable to keep pace with developments in all its different fields. You are writing for an engineer, but not a specialist. It may help to imagine such a person - think of some scientifically educated reader who knows almost nothing about your field (if your thesis is in solid state physics, for example, imagine you are trying to explain it to a logic designer). This section should be interesting. If you bore the reader here, then you are unlikely to revive his/her interest in the design/materials and methods section. For the first sentence or paragraph, tradition permits prose that is less dry than the scientific norm.

*Literature review*

Where did the problem come from? What is already known about this problem? What other methods have been tried to solve it? This is often a difficult chapter to write: you have only been in the field for five or six months and you are trying to review it! Journal review articles are helpful to give you an idea, as are the literature review chapters in relevant Ph.D. theses your supervisor may be able to recommend. Unless your thesis is a review thesis, the review need not be exhaustive, but you will need to make it clear to the reader that you are familiar with the state of knowledge in the area of your thesis. Shorter reviews can be included in the Introduction chapter.

*Theoretical Development/Analysis*

This may need more than one chapter. You do need to include sufficient material to allow the reader to understand all the arguments used and their mathematical bases. Sometimes you will be able to present the theory *ab initio*, but you need not reproduce 20 pages of algebra that the reader could find in a standard text.

Concentrate at least as much on the physical arguments as on the equations! What do the equations mean? What are the important cases? If you include equations, use a good equation editor (such as the one provided by Word) and label the equations as:



You can then refer to them by their number: “…the Lagrange equations of motion (1) can be used to derive...”.

*Design, Materials and Methods*

This varies enormously from thesis to thesis, but even entirely theoretical/numerical investigations will involve design of the software/experiments. There should be evidence of the design process being carried out in the project.

The important thing to remember is that sufficient detail is given for it to be possible for a competent engineer to reproduce exactly what you have done by following your description.

Comments should be made where necessary indicating adjustments made to the project planning schedule during the project, why this was necessary and the actions taken to remedy the situation. Also details of costs should be included.

*Results*

The data often take the form of graphs and some tables, though this varies from thesis to thesis. Do not interrupt your text paragraphs to insert graphs or tables (as opposed to equations). Insert them either at the top of the next page or in between the current paragraph and the next, if there is enough space. For this reason, tables and graphs should be numbered and should include a caption with a brief description of their content. You can then refer to them from the text as: “… figure 3 shows the results of…”.

Make sure that you have described the conditions which obtained for each set of results. What was held constant? What were the other relevant parameters? Make sure too that you have used appropriate statistical analyses. Where applicable, show measurement errors and standard errors on the graphs. Use appropriate statistical tests where relevant.

Take care plotting graphs. Give an explanatory title and label the axes correctly. The origin and intercepts are often important so, unless the ranges of your data make it impractical, the zeros of one or both scales should usually appear on the graph. You should show error bars on the data, unless the errors are very small. For single measurements, the bars should be your best estimate of the experimental errors in each coordinate. For multiple measurements the errors in different data are often different, so, where this is the case, regressions and fits should be weighted (i.e. they should minimize the sum of squares of the differences weighted inversely as the size of the errors.) Seek guidance from your Supervisor how to present your results in the best way possible so that they will not be misleading and so that they will provide the most reliable information for the reader.

*Discussion*

**It is absolutely vital to evaluate your findings critically**. What do your results mean? Do they demonstrate that the proposed engineering solution to the problem is a valid, useful or important one? How do the results fit into the existing body of knowledge and techniques? Do they suggest new theories or mechanisms? Are they consistent with current theories? Do they give new insights?

*Conclusions and suggestions for further work*

Well, what did you find? It is often the case with engineering or scientific investigations that more questions than answers are produced. Again employ critical evaluation of the findings. Does your work suggest any interesting further avenues of investigation? Are there ways in which your work could be improved upon by future workers? This section should usually be only a few pages in length.

*References*

How many do you need? There are often hundreds of references in a Ph.D. thesis. The appropriate number in an honours thesis varies between say several for a highly specific technical project, to perhaps a hundred in a thesis whose main component is a literature review.

*Appendices (if any)*

If there is material that should be in the thesis but which would break up the flow or bore the reader unbearably, include it as an appendix. Computer programs are often included as appendices, as are data files that are too large to be represented simply in the Results section. (Computer programs should be intelligibly annotated.) Examiners usually read appendices only superficially. Number the Appendices A1, A2, A3 *etc.*

**4. References**

1. Towers M.S. & Bonet J., “Writing an Honours Project Thesis”, School of Engineering, University of Wales Swansea, 2007.