HOW TO ORGANISE YOUR THESIS

What is a thesis?

For whom is it written?

How should it be written?

- **Your thesis is a research report.**

- **The report concerns a problem or series of problems in your area of research**

it should describe:

- **what was known about it previously,**
- **what you did towards solving it,**
- **what you think your results mean, and**
- **where or how further progress in the field can be made.**

What 'Graduate Research' is all about

- **The distinguishing mark of graduate research is *an original contribution to knowledge*.**

The thesis is a formal document whose sole purpose is to prove that you have made an original contribution to knowledge.

Failure to prove that you have made such a contribution generally leads to failure.

To this end, your thesis must show two important things:

- **you have identified a worthwhile problem or question which has not been previously answered,**

- **you have solved the problem or answered the question.**

Your contribution to knowledge generally lies in your solution or answer.

The examiners read your thesis to find the answers to the following questions:

- **what is this student's research question?**
- **is it a good question? (has it been answered before? is it a useful question to work on?)**
- **did the student convince me that the question was adequately answered?**
- **has the student made an adequate contribution to knowledge?**

- **A very *clear* statement of the question is essential to proving that you have made an original and worthwhile contribution to knowledge.**

- **To prove the originality and value of your contribution, you must present a *thorough* review of the existing literature on the subject, and on closely related subjects.**

Then, by making *direct* reference to your literature review,

you must *demonstrate* that your question;

(a) has not been previously answered, and

(b) is worth answering.

If your thesis does not provide adequate answers to the few questions listed above, you will likely be faced with a requirement for major revisions

or you may fail your thesis defense outright.

- **For this reason, the generic thesis skeleton given below is designed to highlight the answers to those questions with appropriate thesis organization and section titles.**

- **The generic thesis skeleton can be used for any thesis. While some universities may prefer a different organization, the essential elements in any thesis will be the same.**

Always remember that a thesis is a *formal* document:

Every item must be in the appropriate place, and repetition of material in different places should be eliminated.

A Generic Thesis Skeleton

1. Introduction

- This is a *general* introduction to what the thesis is all about.

Briefly

▶*summarize* the question (you will be stating the question in detail later),

▶some of the reasons why it is a worthwhile question, and

▶perhaps give an overview of your main results.

▶This is a birds-eye view of the answers to the main questions answered in the thesis (see above).

2. Background Information (optional)

- **A brief section giving background information may be necessary, especially if your work spans two or more traditional fields.**

- **That means that your readers may not have any experience with some of the material needed to follow your thesis, so you need to give it to them.**

- **A different title than that given above is usually better;**

e.g. "A Brief Review of Frammis Algebra."

3. Review of the State of the Art

- **Here you review the state of the art relevant to your thesis.**

- **Again, a different title is probably appropriate; e.g., "State of the Art in Zylon Algorithms."**

- **The idea is to *present* the major ideas in the state of the art right up to, but not including, your own personal brilliant ideas.**

4. Research Question or Problem Statement

Engineering theses tend to refer to a "problem" to be solved where other disciplines talk in terms of a "question" to be answered.

In either case, this section has three main parts:

1. **a concise statement of the question that your thesis tackles,**

2. **justification, by *direct* reference to section 3, that your question is previously unanswered,**

3. **discussion of why it is worthwhile to answer this question.**

Now in your *analysis* of the state of the art you would show how each class of current approaches fails (i.e. can handle only small problems, or takes too much time).

In the last part of this section you would explain why the subject that you choose to study is useful; e.g., by describing applications where it can be used.

Since this is one of the sections that the readers are *definitely* looking for, highlight it by using the word "problem" or "question" in the title:

e.g. "Research Question" or "Problem Statement", or may be something more specific such as "The Large-Scale Zylon Algorithm Problem."

5. Describing How You Solved the Problem or Answered the Question

- **This part of the thesis is much more free-form.**
- **It may have one or several sections and subsections.**
- **But it all has only one purpose: to convince the examiners that you answered the question or solved the problem that you set for yourself in Section 4.**
- **So, show what you did that is *relevant* to answering the question or solving the problem.**

6. Conclusions

You generally cover three things in the Conclusions section, and each of these usually merits a separate subsection:

a. **Conclusions**

b. **Summary of Contributions**

c. **Future Research**

a. Conclusions

- **Conclusions are *not* a rambling summary of the thesis: they are *short, concise* statements of the inferences that you have made because of your work.**

- **It helps to organize these as short numbered paragraphs, ordered from most to least important.**

- **All conclusions should be directly related to the research question stated in Section 4.**

b. The Summary of Contributions

- **The Summary of Contributions will be much sought and carefully read by the examiners.**

- **Here you list the contributions of *new* knowledge that your thesis makes.**

There is often some overlap with the Conclusions, but that's okay.

Concise numbered paragraphs are again best. Organize from *most* to *least* important.

c. The Future Research

- **The Future Research subsection is included so that researchers picking up this work in future have the benefit of the ideas that you generated while you were working on the project.**

- **Again, concise numbered paragraphs are usually best.**

7. References

- **The list of references is closely tied to the review of the state of the art given in section 3. Most examiners scan your list of references looking for the important works in the field, so make sure they are listed and referred to in section 3.**

- **All references given *must* be referred to in the main body of the thesis. Note the difference from a Bibliography, which may include works that are not directly referenced in the thesis.**

- **Organize the list of references either alphabetically by author surname (preferred), or by order of citation in the thesis.**

8. Appendices

What goes in the appendices?

Any material which impedes the smooth development of your presentation, but which is important to justify the results of a thesis.

Generally it is material that is of too nitty-gritty a level of detail for inclusion in the main body of the thesis, but which should be available for perusal by the examiners to convince them sufficiently.

Examples: program listings, immense tables of data, lengthy mathematical proofs or derivations, etc.

Getting Started

The best way to get started on your thesis is to prepare an extended outline.

You begin by making up the Table of Contents, listing each section and subsection that you propose to include.

For each section and subsection, write a brief point-form description of the contents of that section.

The entire outline might be 2 to 5 pages long.

Now you and your thesis supervisor should carefully review this outline:

- is there unnecessary material (i.e. not directly related to the problem statement)? Then remove.

- Is there missing material? Then add.

It is much less painful and more time-efficient to make such decisions early, during the outline phase, rather than after you've already done a lot of writing which has to be thrown away.

How Long Does it Take to Write a Thesis?

- **Longer than you think.**

  Even after the research itself is all done -- models built, calculations complete -- it is wise to allow at least one complete term for writing the thesis.

- **It's not the physical act of typing that takes so long, it's the fact that writing the thesis requires the complete organization of your arguments and results.**

- **It's during this formalization of your results into a well-organized thesis document capable of withstanding the scrutiny of expert examiners that you discover weaknesses. It's fixing those weaknesses that takes time.**

- **Students for whom English is not the mother tongue may have difficulty in getting ideas across, so that numerous revisions are required.**

- **And, truth be known, supervisors are sometimes not quick at reviewing and returning drafts.**

- **Bottom line:**

leave yourself enough time. A rush job has painful consequences at the defense.

Tips

- ***Don't make the readers work too hard!***

- **This is fundamentally important. You know what few questions the examiners need answers for (see above).**

- **Choose section titles and wordings to clearly give them this information.**

- **The harder they have to work to ferret out your problem, your defence of the problem, your answer to the problem, your conclusions and contributions, the worse mood they will be in, and the more likely that your thesis will need major revisions.**

Avoid using phrases like:

"Clearly, this is the case..." or "Obviously, it follows that ...";

These imply that, if the readers don't understand, then they must be stupid.

They might not have understood because you explained it poorly.

MS vs. PhD Thesis

- **There are different expectations for Master's theses and for Doctoral theses.**

- **A Doctoral thesis necessarily requires a more difficult problem to be solved, and consequently more substantial contributions. The Ph.D. must be a substantial and innovative contribution to knowledge.**

- **The contribution to knowledge of a Master's thesis can be in the nature of an incremental improvement in an area of knowledge, or the application of known techniques in a new area.**

Do not carry over your ideas from undergraduate assessment:

A thesis is not an answer to an assignment question.

One important difference is this:

The reader of an assignment is usually the one who has set it. S/he already knows the answer (or one of the answers), not to mention the background, the literature, the assumptions and theories and the strengths and weaknesses of them.

The readers of a thesis do not know what the "answer" is.

If the thesis is for a PhD,

the university requires that it make an original contribution to human knowledge: your research must discover something hitherto unknown.

Obviously your examiners will read the thesis. They will be experts in the general field of your thesis but, on the exact topic of your thesis, you are the **world expert**.

Your thesis will also be used as a scientific report and consulted by future workers in your laboratory who will want to know, in detail, what you did.

Theses are occasionally consulted by people from other institutions, and the library sends microfilm versions if requested.

More commonly theses are now stored in an entirely digital form. These may be stored as .pdf files on a server at your university.

The advantage is that your thesis can be consulted much more easily by researchers around the world.

Write with these possibilities in mind!

It is often helpful to have someone other than your adviser(s) read some sections of the thesis, particularly the introduction and conclusion chapters.

It may also be appropriate to ask other members of staff to read some sections of the thesis which they may find relevant or of interest, as they may be able to make valuable contributions.

In either case, only give them revised versions, so that they do not waste time correcting your grammar, spelling, poor construction or presentation.

Style

- The text must be clear. Good grammar and thoughtful writing will make the thesis easier to read.

- Scientific writing has to be a little formal---more formal than this text.
- Native English speakers should remember that scientific English is an international language. Slang and informal writing will be harder for a non-native speaker to understand.

- Short, simple phrases and words are often better than long ones.

- On the other hand, there will be times when you need a complicated sentence because the idea is complicated.

One important stylistic choice is between the active voice and passive voice.

- The active voice ("I measured the compression strength...") is simpler, and it makes clear what you did and what was done by others.

- The passive voice ("The compression strength was measured...") makes it easier to write ungrammatical or awkward sentences.

Title page

See format of theses for EMU: https://grad.emu.edu.tr/en/academic-issues/theses

Abstract

Of all your thesis, this part will be the most widely published and most read because it will be published in Dissertation Abstracts International. It is best written towards the end, 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(s) addressed, your method of solving it/them, your results and conclusions. An abstract must be self-contained. Usually they do not contain references. When a reference is necessary, its details should be included in the text of the abstract. Check the word limit.

Acknowledgments

Most thesis authors put in a page of thanks to those who have helped them in matters scientific, and also indirectly by providing such essentials as food, education, genes, money, help, advice, friendship etc. *If any of your work is collaborative, you should make it quite clear who did which sections.*

Table of contents

The introduction starts on page 1, the earlier pages should have roman numerals. It helps to have the subheadings of each chapter, as well as the chapter titles. Remember that the thesis may be used as a reference in the lab, so it helps to be able to find things easily.

Introduction

- What is the topic and why is it important? State the problem(s) as simply as you can. Remember that you have been working on this project for a few years, 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 broader world of your discipline?
- Especially in the introduction, do not overestimate the reader's familiarity with your topic.
- You are writing for researchers in the general area, but not all of them need be specialists in your particular topic.
- It may help to imagine such a person---think of some researcher whom you might have met at a conference for your subject, but who was working in a different area.
- S/he is intelligent, has the same general background, but knows little of the literature or tricks that apply to your particular topic.

- The introduction should be interesting.
- If you bore the reader here, then you are unlikely to revive his/her interest in the materials and methods section.
- For the first paragraph or two, tradition permits prose that is less dry than the scientific norm. If want to wax lyrical about your topic, here is the place to do it.
- Try to make the reader want to read the kilogram of A4 that has arrived uninvited on his/her desk.
- Go to the library and read several thesis introductions. Did any make you want to read on? Which ones were boring?

- This section might go through several drafts to make it read well and logically, while keeping it short.
- For this section, I think that it is a good idea to ask someone who is not a specialist to read it and to comment. Is it an adequate introduction? Is it easy to follow?
- There is an argument for writing this section---or least making a major revision of it---towards the end of the thesis writing.
- Your introduction should tell where the thesis is going, and this may become clearer during the writing.

Literature review

- Where did the problem come from?
- What is already known about this problem?
- What other methods have been tried to solve it?
  - Ideally, you will already have much of the hard work done, if you have been keeping up with the literature as you vowed to do three years ago, and if you have made notes about important papers over the years. If you have summarised those papers, then you have some good starting points for the review.

- If you didn't keep your literature notes up to date, you can still do something useful: pass on the following advice to any beginning PhD students in your lab and tell them how useful this would have been to you.
- When you start reading about a topic, you should open a spread sheet file, or at least a word processor file, for your literature review.
- Of course you write down the title, authors, year, volume and pages.
- But you also write a summary (anything from a couple of sentences to a couple of pages, depending on the relevance).
- In other columns of the spread sheet, you can add key words (your own and theirs) and comments about its importance, relevance to you and its quality.

- How many papers? How relevant do they have to be before you include them? Well, that is a matter of judgement.
- On the order of a hundred is reasonable, but it will depend on the field. You are the world expert on the (narrow) topic of your thesis: you must demonstrate this.

- A political point: make sure that you do not omit relevant papers by researchers who are like to be your examiners, or by potential employers to whom you might be sending the thesis in the next year or two.

Materials and Methods

- This varies enormously from thesis to thesis, and may be absent in theoretical theses.
- It should be possible for a competent researcher to reproduce exactly what you have done by following your description.
- There is a good chance that this test will be applied: sometime after you have left, another researcher will want to do a similar experiment either with your gear, or on a new set-up in a foreign country.
- Please write for the benefit of that researcher. In some theses, particularly multi-disciplinary or developmental ones, there may be more than one such chapter.
- In this case, the different disciplines should be indicated in the chapter titles.

- **Theory**
  - When you are reporting theoretical work that is not original, you will usually need to include sufficient material to allow the reader to understand the arguments used and their physical bases.
  - Sometimes you will be able to present the theory *ab initio,* but you should not reproduce two pages of algebra that the reader could find in a standard text.
  - Do not include theory that you are not going to relate to the work you have done.
  - When writing this section, concentrate at least as much on the physical arguments as on the equations. What do the equations mean? What are the important cases?
  - When you are reporting your own theoretical work, you must include rather more detail, but you should consider moving lengthy derivations to appendices.
  - Think too about the order and style of presentation: the order in which you did the work may not be the clearest presentation.
  - Suspense is not necessary in reporting science: you should tell the reader where you are going before you start.

Results and discussion

- The results and discussion are very often combined in theses.
- This is sensible because of the length of a thesis: you may have several chapters of results and, if you wait till they are all presented before you begin discussion, the reader may have difficulty remembering what you are talking about.
- The division of Results and Discussion material into chapters is usually best done according to subject matter.
- 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.

- Take care plotting graphs.
- 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 these should include the standard error in the data.
- 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.) (A common failing in many simple software packages that draw graphs and do regressions is that they do not treat errors adequately.
- UNSW student Mike Johnston has written a plotting routine that plots data with error bars and performs weighted least square regressions.
- It is at http://www.phys.unsw.edu.au/3rdyearlab/graphing/graph.html).
- You can just 'paste' your data into the input and it generates a .ps file of the graph.

- In most cases, your results need discussion.
- What do they mean?
- How do they fit into the existing body of knowledge?
- Are they consistent with current theories?
- Do they give new insights?
- Do they suggest new theories or mechanisms?
- Try to distance yourself from your usual perspective and look at your work.
- Do not just ask yourself what it means in terms of the orthodoxy of your own research group, but also how other people in the field might see it.
- Does it have any implications that do not relate to the questions that you set out to answer?

Conclusions and suggestions for further work

- Your abstract should include your conclusions in very brief form, because it must also include some other material.
- A summary of conclusions is usually longer than the final section of the abstract, and you have the space to be more explicit and more careful with qualifications.
- You might find it helpful to put your conclusions in point form.
- It is often the case with scientific investigations that more questions than answers are produced.
- Does your work suggest any interesting further avenues?
- Are there ways in which your work could be improved by future workers?
- What are the practical implications of your work?
- This chapter should usually be reasonably short---a few pages perhaps.
- As with the introduction, I think that it is a good idea to ask someone who is not a specialist to read this section and to comment.

- **References (See also under literature review)**
  - It is tempting to omit the titles of the articles cited, and the university allows this, but think of all the times when you have seen a reference in a paper and gone to look it up only to find that it was not helpful after all.

- **Appendices**
  - 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.
  - Some things which are typically included in appendices are: important and original computer programs, data files that are too large to be represented simply in the results chapters, pictures or diagrams of results which are not important enough to keep in the main text.

- It is better to produce a short, well-written thesis than a long one full of irrelevant padding.

The format can follow the sequence:

- Introduction;
- Materials and Methods;
- Results;
- Discussion;
- Conclusions

with a chapter for each, or, in theses which describe several related experiments,

- it is often more appropriate to have a series of self-contained chapters, each presenting the results of a particular aspect of the overall research programme.
- Thus, each chapter in the experimental section of the thesis may contain its own Introduction, specific Materials and Methods, Results and Discussion sections.

- The thesis should then conclude with a General Discussion and Conclusions chapter that draws together the results from the various chapters and discusses them in the wider context of existing knowledge

- A thesis should normally be written in the past tense and should be as concise as possible.

- Standardisation of format is important: the first step is to divide the thesis into a number of distinct chapters, the contents of which are discussed below.

- Each chapter, which should start on a new page, will normally be divided into sections for clarity. The way in which this should be done is illustrated in the section on layout

Acknowledging the Work of Others

- Your thesis MUST be your own work. Where data is shared in co-operative projects, the source and extent of your own contribution should be indicated.

- Your supervisor is expected to provide additional guidance on format and style, which will usually include editing of sample chapters in draft form.
- However, the final form and content are your own responsibility

Acknowledging Past Work

- Past work provides the foundations on which we build new knowledge.
- Careful review of published work is therefore an important component of any good thesis.
- However, students are reminded that reproducing the thoughts, views or results of other people without appropriate acknowledgement of the source is termed **'plagiarism**' and constitutes a serious academic offence within the University.
- Its definition in the University Calendar is "the substantial use of other people's work and the submission of it as though it were one's own. Work ……which is … required work forming part of the degree, diploma or certificate assessment, must be the candidate's own work, and must not contain any plagiarised material."
- When reporting material from the literature in a thesis it is therefore essential to acknowledge the source of that information
- This regulation permits the quotation of sections direct from published work, but only within quotation marks and with the source cited. The correct citation and bibliography formats are given in the notes that follow

THE ABSTRACT

- This should be used to describe BRIEFLY the purpose and nature of the project, the experiments carried out and the important results obtained.

- One copy should be bound in the thesis between the Table of Contents and the Introduction. The Abstract should not be more than 300 words in length

GENERAL INTRODUCTION

- The main aim of this chapter is to introduce the reader to the main part of the thesis, giving the background to the work undertaken.

- It should present the problem that is being studied and its context, and explain the aims of the project

INTRODUCTION

- The introduction will usually include a review of the existing information (the Literature Review) and an account of relevant theory and methods of investigation.

- This section may be approached as an historical record of the general advances in the subject, but should always focus on the problem being studied.

- The Literature Review must never become merely an encyclopedia of other people's work but rather should attempt to interpret and draw conclusions about the current state of knowledge.

- There is often a tendency to repeat much of the Literature Review in the discussion of results: this MUST be avoided. Sometimes, it may be appropriate to divide the introduction into more than one chapter, particularly where theory needs to be presented as the basis for subsequent measurements and analysis

MATERIALS AND METHODS

- Details of the methods used and the principles should be explained. The material should follow a logical sequence, for example the order in which this work was done or the ranking of techniques employed in order of importance.

- Refer to standard techniques, but where new techniques have been developed or modifications made to an existing method, give them in full.

- It may be appropriate to have a General Materials and Methods chapter containing material relevant to the entire thesis, with details of approaches unique to specific experiments being reserved for the appropriate chapters

RESULTS

- The objective is to present the results obtained in a way that is acceptable as evidence to the reader.

- This can usually be best achieved by presenting the data mainly in Tables and Figures, with the necessary minimum of verbal explanation.

- In the text the same data should not be presented in the form of both Tables and Figures, although there are occasions when this may be justified to make a particular point.

- It is not necessary to include 'raw' data in the results unless they are pertinent.

RESULTS

- Where statistical comparisons are needed, use phrases such as "using an analysis of variance, the differences were significant".

- Full statistical analyses can, again, be included in the Appendices, although full details of the type of statistical analyses performed should be given in the Materials and Methods.

- Standard errors or standard deviations should be included in Figures and Tables where appropriate

- Each Results chapter should contain a concise Discussion section discussing the significance of the results presented in relation to previous knowledge.

- In some cases it may be appropriate to have only a single Discussion chapter at the end of the thesis

GENERAL DISCUSSION

- The results presented in the various Results sections or Chapters should be drawn together and discussed in relation to previously published data, giving information on the advances made and presenting conclusions.

- Speculation about results obtained in relation to other known facts may also be useful.

- In addition, you should discuss the possible theoretical or practical significance of your results and highlight possible areas for future research.

DISCUSSION

- The purpose is to bring the various findings together in an interpretative manner.

- The discussion is often the most difficult part of a thesis to write and you should bear in mind that repetition to emphasise a point usually serves to labour it and often detracts from clarity

CONCLUSIONS AND FUTURE WORK

- This section, which may be either a separate chapter or more usually a concluding section of a Final Discussion, should consist of a concise recapitulation of the objectives, results obtained and conclusions and possible future research objectives.

- However, care should be taken to avoid repeating verbatim the thesis Abstract or material already presented in the Final Discussion

INSTRUCTIONS FOR THE PRESENTATION OF YOUR THESIS

- As the format for presentation is reviewed regularly students are advised to check current instructions before printing. At the time of going to press the University Regulations indicated the following: Theses should be in double-spaced typescript on single-sided A4 paper. There should be a margin of at least 1.5 inches, preferably 2 inches (5cm), on the left side of the page, both for typescript and for diagrams, to allow for binding. Other margins should be of at least 1 inch (2.5 cm). The text should preferably be in a proportional font at a point size of 12

- You should also refer to the University Regulations which constrain some aspects of the presentation

HEADINGS AND TITLES

- The title of the thesis should be typed on the first page in capitals (not underlined), followed by the name of the Author, year and degree sought.

- The components of the thesis should follow a logical system of numbering.

1.1 MAIN SECTION HEADINGS

Main section headings should be in capital letters as above. They should NOT be underlined, indented or punctuated. They should be followed by a new paragraph. The number attached to each main section heading should give the chapter and section numbers, followed by the main section heading, as shown

1.1.1. Sub-section titles

Divisions of main sections should be preceded by their chapter numbers, their main section number and their own section number, as shown. Again, these headings should NOT be punctuated or underlined. The first letter of each word in the subsection title should be in capitals; the remainder should be in lower case. The whole heading should be in bold typeface. Each subsection of a main section should be followed by a new paragraph

- **1.1.1.1. Further sub-divisions** (sub-subsection titles)
- If it is necessary to break down the divisions of main sections any further, then sub-section titles should be used. Ideally these should be in italics, but if this is not possible, they should be in lower case and underlined. They should be numbered with the chapter number, the main section number, the sub-section number and their own sub-subsection number, and the text should start as a new paragraph. Further levels of sub-division should be avoided if at all possible
- All of the above layout can be achieved on standard word processing packages. Laser printers are able to print headings in a range of different point size, and if this facility is available then the chapter headings ONLY may be printed in a slightly larger point size (14), although all other aspects of style should be adhered to

CITATION OF REFERENCES IN THE TEXT

- Detailed instructions on how to cite references in the text and compile a bibliography can be found in Citing References and Compiling a Bibliography Information Leaflet No.9 which is available from the library. An abridged version with specific examples is given here

- The Harvard system of author and date citation of references should be used. This may be done in two ways, i.e.

- "Brown, Smith and Jones (1980) and Green (1981) confirmed these conclusions" or

- "These results were confirmed by subsequent experiments (Brown, Smith and Jones, 1980; Green, 1981)."

- Note, particularly, the different types of punctuation and use of parentheses for these two styles of citation. If there are three or fewer names, all surnames should be given the first time that the reference is used. If there are more than three authors references should be quoted as "Brown et al. (1980)"

- This form of citation should also be used for all subsequent citations of references where there are three or more authors. Where more than one reference is used for the same author(s) in the same year, letters of the alphabet should be used to distinguish between them, e.g. "Brown et al. (1980 a, b)". When quoting the unpublished data of other people this should be included as a personal communication. In such cases the full initials of the author should be given in the text, and the appropriate citation is "(Brown, J.C. personal communication)".
  No citation of such personal communications should be included in the Bibliography. The same rules apply when citing your own unpublished data

BIBLIOGRAPHY

- All references cited should be presented in the Bibliography in alphabetical order of the first author, and where necessary by the second and subsequent authors, again using the Harvard system of author and date citation. Specific examples of style and layout are indicated below

- References to journal papers should include the following:

- 1. Name(s) of author(s) in capitals followed by initials
  2. Year of publication in parentheses
  3. Title of papers (without capitalisation)
  4. The full title of the journal in italics (or underlined if italics are not available)
  5. Volume number and page numbers

- The correct style of punctuation to use can be seen in the examples set out below. Unlike the rest of the thesis (which should be double-spaced throughout) the Bibliography should be in single-line spacing within entries and double-spaced between references, as shown. The second and subsequent lines of each reference should be indented, as indicated

- DASCH, J.M. (1987) Measurement of dry deposition to surfaces in deciduous and pine canopies. Environmental Pollution, 44, 261 - 277
- BARNARD, C.J. and HURST, J.L. (1996) Welfare by design: the natural selection of welfare criteria. Animal Welfare 5, 405-433
- SWIFT S., STEWART G.S.A.B. and WILLIAMS P. (1996) The inner workings of a quorum sensing signal generator. Trends in Microbiology 4, 463-465

- References to booklets and bulletins are laid out in a similar manner to journal papers. However, it is the title of the booklet or bulletin which should be in italics. Where no author's name is given for such publications, the reference in both the text and the Bibliography should be to the adopting organisation (eg MAFF, FAO, WHO). Only in exceptional circumstances, therefore, will it be necessary to have any anonymous references in the thesis. Specific examples are:
- MINISTRY OF AGRICULTURE, FISHERIES AND FOOD (1975) Energy allowances and feeding systems for ruminants. Technical Bulletin 33. HMSO, London
- DEPARTMENT OF THE ENVIRONMENT (1991) Potential effects of climate change in the United Kingdom. HMSO, London

- References to books can be of two types, references to a whole book and references to parts of a book. Both should give the name(s) of author(s), date of publication, title of book (in italics), name and location of publisher. References to parts of books should also include the title of the chapter with its pagination, but without capitalisation as indicated below
- FRITSHEN, L.J. and GAY, L.W. (1979) Environmental Instrumentation. Springer, New York
- O'CONNER, M. and WOODFORD, F.P. (1975) How to cite references. In: Writing Scientific Papers and Theses, pp. 79-86. Heinemann, London
- HOLMES, C.W. and CLOSE, W.H. (1977). The influence of climatic variables on energy metabolism and associated aspects of productivity in the pig. In: Nutrition and the Climatic Environment, pp. 51-73 (Eds. W. Haresign, H. Swan and D. Lewis) Butterworths, London

GENERAL POINTS

- In addition to the above specifications, there are a number of other general consistencies in style that must be adhered to in a thesis
- The use of italics - Italics should be used in two circumstances. Firstly, they are used for sub-subsection headings, journal names and book titles, as already described. Secondly, they are used for foreign phrases and species names (e.g. ad libitum, per se, Vicia faba, Mus musculus.). If an italic font is not available, then all of these should be underlined in both the text and Bibliography. Italics or bold font may also be used for emphasis, for example where an entity is first defined
- Abbreviations and Symbols - should conform to either BS 1991 Pt. 1 (1967) Letter Symbols, Signs and Abbreviations, or to the current Royal Society recommendations. Copies of both of these can be found in the Library. Units should be expressed using the Metric SI (System International) system. Where original data were published in imperial units, these should be converted to metric equivalents before inclusion. Some of the more common points are covered below, with examples
- 1. Unit abbreviations - These are the same in both the singular and plural (e.g. 1 ml and 10 ml) and are not followed by a full stop
- 2. Derived units - These should use superscript numerals (eg cm s-1) rather than the solidus (cm/sec)
- 3. Numbers - All whole numbers up to ten should be written in words, except for dates, sums of money or units of measurement (eg length, weight); all others should be written in figures. No sentence should ever start with figures. The abbreviation % should always be used in Tables and Figures. In the text the words 'per cent' should always be used in conjunction with numbers written in words, and the abbreviation % used in conjunction with numbers written in figures. Dates should be written as 21 June or 15 March and NOT 21st June or 15th March

TABLES AND FIGURES

- It is normally advisable to prepare each Table or Figure on a separate page, although small Tables may be incorporated in the text and small figures may be grouped.

- Both should be numbered in sequence within each chapter, prefixed by the chapter number (eg Table 5.1, Figure 6.4).

- Every Table or Figure should have a caption that should provide a concise description of the material presented.

- The caption should be brief, but should contain sufficient information to make the Table or Figure self-explanatory without reference to the text.

TABLES AND FIGURES

- The units used should always be clearly stated. Graphs and histograms should be drawn with high quality graph-plotting packages.

- The accompanying text must refer to the Figure or Table, and draw the attention of the reader to the main features of the information presented without repeating that information.

- Computer-drawn graphs do not always reach thesis quality, and should be checked carefully for anomalies and errors, which can still be introduced by standard programmes

PAPERS PUBLISHED FROM YOUR THESIS

- Whilst the submission of a thesis is the first priority, describing work in this form is only half the job - you should also expect to present your results and analysis in refereed papers in reputable journals.

- The period between completion of the thesis and the examination is a good opportunity for paper writing, but there are often opportunities to publish parts of your work even during the project period, particularly at conferences. Such papers must be much more concise than a thesis

- Journals and editors of conference proceedings often have their own specific requirements regarding style and presentation. Always examine the appropriate Instructions to Contributors before starting to write a paper, and work to them throughout.

PAPERS PUBLISHED FROM YOUR THESIS

Before **submitting drafts of portions of your thesis for review by your peers and by your advisor, please have the common courtesy of doing the simple things:**

Always **run your spell checker.**

Always **re-read your document *at least* a day after you have written it and fix all of the obvious things.**

Use correct page layout and formatting, including double spacing so that editors can insert comments.

Near the beginning of the writing process, you may want to take advantage of one-on-one feedback from a tutor in the Writing Center, which is a free service. Make a half-hour appointment to discuss any aspect of the writing process.

Be aware that the tutors will not edit your thesis.

You will be tempted to delay including references in your thesis until the end of the writing process.

This is a big mistake. Prepare your list of references as you go, from the very beginning of the writing process. Otherwise, you may fail to give appropriate credit

when you summarize ideas and results, which is a form of plagiarism.

Do not reference work that you have not read (at least in part including the introduction and conclusion).

Developing your list of references as you write is much less work in the end.

- Students often think that the references are not important and are careless when transcribing author and journal names.

- You must *double check* each detail of every
- reference listed. Scientists get very annoyed when their names are misspelled.

- Journal editors, referees, and type setters get very annoyed when misinformation and incorrect protocol are used in references. Advisors get annoyed when they have to correct the reference lists in theses because students are casual about it. The references matter.

A list of various references appears at the end of this document as examples.

[1] The list includes a reference to a journal article

[2], a reference to a page in a book

[3], a reference to multiple pages in a book

[4], a reference to an individual author contribution to an edited volume

[5], a reference to a conference proceeding

[6], a reference to a work that is not yet published

[7], a reference to a dissertation

[8], and a reference to a private communication.

- Reference numbers should appear in square brackets throughout the text in numerical order as shown in the previous paragraph.

- The same reference number may appear more than once in the text, but undue repetition should be avoided.

- You may place your reference list at the end of the entire thesis or at the end of each chapter when there are many chapters (some duplication of references may result).

Equations

2.4 Punctuate equations appropriate to the sentence that contains them [1]. (You get a brownie point if a sentence structure requires a question mark immediately following an equation, but this rarely occurs.) Let entire equations function as a noun (or the restatement of a noun) in a sentence, although it is permissible to allow an equal sign to function as a verb (less desirable). All significant equations should be offset to a line of their own and given a reference number. Small and less important equations can be embedded within the text unless they require line numbers for later reference. If a thesis contains many chapters and many equations, the equations in chapter 1 should be indexed as (1.1), (1.2), etc., and the equations in chapter 2 indexed as (2.1), (2.2), etc.

Figures

- Figure captions should be concise and descriptive. Write figure captions using a smaller
- font (10 point). For graphs, be sure to include appropriate units and to provide a legend
- referring to the different curves as in Fig. 2. Each figure should be described carefully
- within the text of your thesis.

Obtain feedback at every step of the writing process.

Go over your outline wit your advisor. It is much less painful to rearrange or to delete sections *before you write them*, when they are represented merely in outline form.

Make brief notes indicating what will go into each section (e.g. a summary of research by Group X and Y, a schematic of an experimental setup, a blowup view of a critical part, etc.).

Discuss your initial ideas and brainstorm together with your advisor.

You should start writing portions of your thesis early, even though some sections

will need to wait until after the research is concluded.

When possible, begin making figures

--- even hand-drawn sketches in your lab notebook.

Remember to develop the overall outline before writing specific sections. This helps to avoid writing material that might later have to be discarded.

As you write portions of your thesis, show them to your advisor and to other members in your research group for valuable feedback. Your advisor will be much

happier reviewing short pieces of your writing periodically, as opposed to reviewing it all at once near the due date.

As you receive feedback along the way, you can apply it to sections

not yet written.

The periodic feedback helps you to revise and reshape your outline

continually and guides you in developing a clear scientific writing style.

Audience

- You should consider as your audience the other students in your research group.
- In particular, after you graduate, your thesis might be used as a resource for students who will move into your former role. Avoid making your thesis too basic; you may assume a certain level of sophistication on the part of the reader.

However, the thesis should be easily understandable to a physics professor whose research expertise is in a different field.

3.4 Coherence

Just as the overall outline of the thesis should have a clear and logical organization, the sequence of information presented in each section and paragraph should also follow a logical flow.

Continually ask yourself which paragraphs should appear before others. You should be aware of a key sentence in each paragraph which usually appears near the beginning and defines what the paragraph is conveying.

If a paragraph is very lengthy, don't hesitate to break it into two (at a logical place). Read your own writing for logical progression and for smoothness. Develop the skill of crafting smooth transitions.

3.5 Conciseness

- Use simple declarative sentences often, but not exclusively. Make every word count.

- Vary sentence length. Intermingle short with long sentences in an aperiodic fashion.
- You might inadvertently kill a reader with boredom if your sentences all have the same length.
- In your writing, be as quantitative as the subject matter permits, and avoid inexact word usage. Continually ask yourself how your writing might be misinterpreted.

- Make sure that arguments are logically complete.

3.6 Active voice

Remember that active verb construction generally captures the reader's attention more than does passive construction.

This does not mean that passive voice should never be used. Just keep in mind that an over reliance on passive verb construction results in a rather bland document.

Appendix A: Things that belong in an appendix

The purpose of an appendix is to provide supplementary information which would

distract if included in the main body of the thesis.

Items appearing as an appendix might include lengthy derivations. If students feel compelled to include a brief tutorial on relevant background information (not new research), it should appear as an appendix.

An appendix might consist of portions of unique computer code that was developed as part of the project.

Appendix B: Presenting a talk

▶APPENDICES are the place in a thesis to store 'raw' material if needed.

When presenting your thesis work in a talk, you will want to convey an overview of your thesis as a whole. However, you must pick and choose what to emphasize since time will be limited. There is no formal oral defense requirement for the senior thesis (although there is for an Honor's Thesis). However, the department encourages students to make at least one formal presentation in a department meeting (e.g., at the Atomic Molecular and Optics meetings or the Discussions in Theoretical Physics meetings). All students doing a senior thesis, and especially those receiving department funding, are expected to participate in the annual Spring Research Conference held each March in the College of Physical and Mathematical Sciences at BYU. Depending on available travel resources, students may also have the opportunity to present a talk at a professional meeting, either regional (e.g. at the annual APS Four Corners meeting) or national (e.g. the annual meeting of the Optical Society of America).

WRITING THE THESIS

- A rough draft of the thesis can be initiated by writing out what you've learned from the research in a manner that is simply comfortable for you to do in a short time, with the understanding that it will take several drafts to reach the form of an acceptable thesis article.

- However, before writing down each sentence, ask yourself

"why am I including this information?"

Sometimes, information is put into a thesis paper only because it is available, not because it is relevant. For example, suppose you are writing about a traditional Chinese treatment strategy for a particular disease.

- Why spend three pages of text writing about how many cases of the disease there are, or even describing at length the modern treatment methods?

- Is it relevant to the presentation? If not, don't include it; if it is partly relevant, include only the essential points.

- It is important to keep in mind basic writing skills: sentence structure and paragraph form. These aspects of your writing are independent of the nature of the topic or the fact that it is a thesis paper.

- As each draft of the paper is worked though, the structural quality of the sentences and paragraphs should improve.

- This will reflect not only your review of the existing document to find errors or shortcomings, but also your increasing understanding of the subject as you try to explain it to others.

- For the follow-up drafts, it is necessary to review each of the sentences and ask yourself:

"How do I know this?"

In a thesis paper, most statements must be backed up by something authoritative, with a reference to the source material. Not every sentence or every paragraph will have a reference, but it should be entirely clear to both you and the reader how you have come up with your statement.

If you have stated something that you believe but for which there is no supporting information, then you are obligated to either leave it out or to make it clear that this statement is what you personally believe.

There is one exception to the rule, which must be pursued carefully.

If there is generally known, broadly accepted information, then it need not be referred to a source.

As a trivial example, if you want to point out that the sky is blue, you don't have to reference that to an authority nor indicate that this is just your opinion.

Most statements of this nature are transitional; that is, they link one piece of referenced information to another, otherwise, they would be nonessential because they are widely known.

The thesis must include, in the form prescribed below, and exemplified in the specimen pages in the given order:

- Title Page
- Approval Sheet
- Copyright Page
- Preface (or Acknowledgements, or both)
- Table of Contents
- List of Tables (if tables are located in the text)
- List of Illustrations (or Figures, if either are located in the text)
- Abstract
- Foreword (optional)
- Half-title Page
- Text (including half-title pages for parts, if parts are employed as groups of chapters)
- Appendices, if any (tables and figures may be located here instead of in the text)
- Bibliography
- Vita

- Title page *(sample included at the end; the title should be specific and reflect project objective and experimental nature of it)*
- Abstract *(to be written after the project is done, see below)*
- *(Task and Purpose: only for MEE 490 Project Reports)*

Contents[*Nomenclature*] *(complete, unique and with units)*

- [*1. INTRODUCTION*]
- [*2. THEORY*] *(be brief, only what you need for your project/calculation, make references instead of derivations, etc.)*
- [*3. APPARATUS AND INSTRUMENTATION*] *(Emphasize this section with appropriate graphics: layout, schematics and/or drawings of apparatus/test-sections/specimens/instrumentation)*

- *4. EXPERIMENTAL PROCEDURE (Be specific so that others could do your experiment following your report only)*
- *5. RESULTS AND DISCUSSION (with uncertainty/error analysis and justification and interpretation of the results)*
- *6. CONCLUSIONS AND RECOMMENDATIONS (summary and interpretation/judgement of the results and specific suggestions for improvements for the future work)*
- ***Acknowledgments (if appropriate)***
- ***References (as per the ASME recommendations)***
- ***Appendices***

Abstract

The abstract is a *summary* of the thesis, *not an introduction*. Keep in mind that abstracts are often published separately from the paper they summarize. In your abstract, give a concise synopsis of the work, emphasizing the conclusions; you need not include the supporting arguments for the conclusions. The purpose of the abstract is to help prospective readers decide whether to read your thesis, but your goal is not necessarily to persuade people to read your thesis. In fact, a successful abstract enables people to get an accurate overall view of your work without needing to read it. Usually, an abstract contains a single paragraph, but it can have more (try to keep it to less than a page). In the abstract, remember to state the subject of the paper immediately followed by a summary of the experimental or theoretical results and the methods used to obtain them. Avoid equations, graphics, and citations; if a citation is essential it must be cited fully within the abstract. Keep the abstract factual; don't make it "cute." Use lower-case Roman numerals to number pages beginning with "ii" on this page.

Abstract

- **A good "Abstract"** should be straight to the point; not too descriptive but fully informative.

- First paragraph should state what was accomplished with regard to the objectives. The abstract does not have to be an entire summary of the project, but rather a concise summary of the scope and results of the project. It should indicate to a reader whether to read or not the full text.

- By its nature an abstract should be short, usually about 150 words but never more than 500 words.

- NOTE: Since Abstracts are also published separately from the articles/papers, they should be self-sufficient (no specific references to paper details, like Fig.1, etc.) and without graphics, tables, complex equations, and similar. Abstract (specific to-the-point) and Introduction (general, descriptive) are quite different.

ABSTRACT

- **INTRODUCTION** introduces readers to the main part, **ABSTRACT** is a summary of the most important results of the whole report, etc.

- **INTRODUCTION** is descriptive, **ABSTRACT** is **not**;

- **INTRODUCTION** does not include results, **ABSTRACT emphasize** the main results;

- **ABSTRACT** is usually shorter than **INTRODUCTION**,

Nomenclature

- *The **"Nomenclature"** should comprise all symbols used in the Report (equations, figures, tables. etc.), listed in alphabetical order with small letters after capital ones (i.g.: A, a, b, C, c...) first all Latin then Greek.*

- *Each symbol should be briefly defined and/or referenced to appropriate equation or the source along with the units of measurement (i.g.: D outside shaft diameter [m].*

- *Do not list units in the nomenclature as separate items). Common subscript or superscript should be listed at the end.*

- *Nomenclature should be unique (one symbol to one quantity and vice-versa), and complete (all symbols in the report [text, equations, tables, figures appendices, etc] should be listed in the nomenclature)*

Acknowledgments

This page is optional. You may acknowledge whom you will --- your advisor,

colleagues, family members. Please keep acknowledgments in good taste.

I would like to acknowledge Dr. Kristine Hansen, Associate Dean of General Education for Composition,

and Dr. Elizabeth Hedengren, Writing-Across-Curriculum Consultant, for providing motivation to this project and also for valuable information presented in their Advanced Writing Seminar. Many of the ideas presented herein were taken from the seminar with no attempt being made to reference original sources. I also wish to thank Jean-Francois Van Huele, Steven Turley, and Ross Spencer for reviewing this document and for ripping it to shreds as every good advisor should do to a thesis draft.

Introduction

- ***"Introduction"** usually describes the background of the project with brief information on general knowledge of the subject. Remember to paginate your report.*

Theory

- **"Theory"** elaborates all necessary principles, laws, and equations used in the report later; and defines any unfamiliar terms or refers the reader/user to the references for further explanations.

Apparatus

- **"Apparatus"** section should provide full and precise identification of all equipment and instrumentation used. A sketch of the test setup, photographs, assembly drawings, and sketches, together with names, rating, classifications, and sizes, will aid in establishing full identification.

Experimental Procedure

- **"Experimental Procedure"** should state the nature of test runs, with reasons. Special precautions for obtaining accuracy and means for controlling conditions should be described. Chronological procedure and so called "data sheet(form)" should be included.

Results and discussion

- **"Results and discussion"** section includes all necessary calculations and presentations of the data in graphical and/or tabular form. The uncertainty/error analysis must be performed on the basis of known or estimated instruments' and measurement uncertainties and statistical analysis. Gross plotting may be advantageous. The findings are to be summarized according to the significance to the stated objectives. Bulky details and repetitive tasks should be presented in Appendices.

Conclusions and Recommendations

- **"Conclusions and Recommendations"** are to be drawn with reference to the previously stated objectives of the project.

- Conclusions should be supported by specific data and results, and wherever possible compared with theory and data obtained by others.

- Recommendations are often more important than conclusions. We always know how to do better after we finish a project, i.e. after we obtain an appropriate experience. Particularly students experiments are hampered due to lack of experience, time, methods and equipment as well as insufficient attention to accuracy and details.

- Recommendations should be given for any further changes or work that would better accomplished the project objectives.

F. Additional Material (Must appear in the following order)

▶1. Appendices, if any. A single appendix is labeled “APPENDIX” on the contents page, with or
▶without a title. (If using a title, it should be written as “APPENDIX: TITLE”.) The first page of
▶the appendix itself is labeled by the word “APPENDIX” (centered) and a title capitalized and
▶centered after a skip line. Several appendices are labeled “APPENDICES” on the contents page,
▶with subsequent lines each containing an indented alphabetic identifier and title such as “A:
▶SURVEY QUESTIONAIRE”; other lines (labeled B, C, etc.) follow as needed. The appendices
▶proper are then each labeled as “APPENDIX A” (centered) followed after a skip line by the title
▶centered and capitalized. Long appendices should be preceded by half-title pages. Appendix
▶pages should be numbered as a continuation of the text.

2. Bibliography. A bibliography is a list of available publications that the reader may consult for

further information on the topic. It is to be distinguished from a list of citations. The thesis must

have a bibliography, even if it repetitiously contains only the information already listed in the

citations. In some instances, it may be appropriate to segment the bibliography. Use appropriate

subheadings at the left margin for the segments.

3. Vita. The vita is a one-page biographical sketch of the author containing the full name, date and

place of birth, educational background, degrees and dates, and other pertinent training or

experience.

Thesis Format and Appearance Guidelines

The Institute of Graduate Studies and Research

Eastern Mediterranean University……

updated info can be obtained from below link:

https://grad.emu.edu.tr/en