Project Title

by

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Abstract

This is a template thesis for postgraduate research students in the School of Mathematics and Physics. It is completely optional and provided without any liability for issues arising from its use. It has been developed with input from staff and students in the school. See chapter 1 for details about the template and suggestions for how to use it.

Dedication

To...

Declaration

The work contained in this thesis is my own and has not been submitted for any other degree or qualification at this or any other university. Where materials are submitted by me for another degree or work undertaken by me as part of a research group has been incorporated into the thesis, the extent of the work thus incorporated has been clearly indicated. All sources of information have been acknowledged or referenced. This thesis contains fewer than 80,000 words.

Student Name

December 2025

Acknowledgements

I would like to thank...

List of Symbols

Below is a list of symbols used in the thesis.

c Speed of light in a vacuum

h Planck constant

List of Figures

List of Tables

Contents

Chapter 1

Template Information

This thesis template has been created for students in the School of Mathematics and Physics to help minimise the time lost in the preparation of a suitable LaTeX document that would be better spent writing. Although many similar templates are available online or are circulating between people, a simplified version geared towards the subject area has been identified as something that would be welcomed.

The core principle in the development of this particular template was simplicity. It tries to use only common LaTeX packages and only the minimum to get a clean, clearly structured thesis but with the kind of features that are important to a Mathematics or Physics document (e.g. equations). Advanced users are free to add their favourite packages to customise the document, but there should also be enough here for students to jump in and get writing if they prefer.

Note that this has been prepared with the standard monograph thesis in mind but a template cover page for the Thesis with Publications format is included in the Chapter 8 if you are submitting under that. Please refer to the university guidance for that submission model if required. That chapter also includes advice about declarations to use if you are using the standard monograph style but have substantial parts of a publication in a chapter. You should also confirm if the latest version of the template cover page has been updated in the university guidance and correct this version to match if needed.

The university regulations supersede anything provided here and you are responsible for ensuring that the submitted thesis meets any requirements for the degree you submit for. *For example, you are responsible for checking that the title page contains the necessary information.*

Use of this template is completely optional. It has not defined what the chapter content should be as this can vary between fields. You should discuss the thesis structure with your supervisory team if you are unsure.

1.1 Formatting

Some guidance from the university on thesis formatting that is available online (as of July 2025) has been copied here for reference.

The first page of the thesis must include the following:

- Author's full names
- Degrees held by the author
- Title of Thesis (as approved by the School Postgraduate Research Committee)
- Degree for which it is offered
- School to which it pertains
- Date of submission (month/year)

The pages and illustrations must be numbered consecutively. The text may be presented in either one-and-a-half or double-line spacing.

Margins should generally be standard document template sizing, and consistent throughout, unless exceptions (e.g. full page maps, fold-outs etc.) require a deviation from the standard.

There is no formal requirement on font style or size but it is generally recommended to use a minimum of size 11 font for main bodies of text, and a default sans-serif font style such as Arial or Calibri.

In this template, a Latin Modern sans serif font is used as Arial and Calibri are not standard LaTeX fonts. See https://tug.org/FontCatalogue/ for more fonts and how to use them if you prefer a different one to that used here.

1.2 How to use this template

The remainder of this template has been arranged into chapters, appendices and a reference list. Starting at chapter 1 (this chapter), the TeX files have been placed into a subfolder called Chapters for easier organisation. You can comment out (or remove) the \input command referring to a section that you don't want to include. Files for 8 chapters, a conclusion and 2 appendices are included but you may not need all of these or you may wish to add more. Likewise, sections like the List of Symbols or Dedication that are optional can be commented out of the main .tex file as desired.

The rest of this chapter showcases some LaTeX features to give you examples that you can adapt to your content. This only covers the basics, which may be enough for you, but there is copious information online, including many excellent Overleaf guides, if you want to go into more depth. The compiled pdf will show you how certain things look and appear in the final document but refer to the .tex file for this chapter to see the LaTeX commands used in each section.

1.3 Mathematics

Use the \begin{equation} ... \end{equation} environment to display a single equation that is numbered according to the chapter and equation number.

$$\mathbf{F} = q\left(\mathbf{E} + \mathbf{v} \times \mathbf{B}\right) \tag{1.1}$$

As for many environments (chapters, sections, figures), use the \label command to allow references back to the equation using \ref. For example, here we can write that equation 1.1 shows the Lorentz force where q is ...

For an unnumbered equation, use \begin{equation*}:

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

Use \begin{align} to create a set of equations aligned to a particular point that you set using the & symbol (see the .tex file):

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0} \tag{1.2}$$

$$\nabla \cdot \mathbf{B} = 0 \tag{1.3}$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \tag{1.4}$$

$$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} + \mu_0 \varepsilon_0 \frac{\partial \mathbf{E}}{\partial t} \tag{1.5}$$

In-line equations can be created a few ways such as enclosing it inside two $ symbols to show something like $E = mc^2$ or $e^{i\pi} = -1$. Of course, be sure to always define any terms you use or make use of the List of Symbols page

This is a tiny sample of what's possible with Mathematics in LaTeX. Consult an online guide for more options if you need them.

1.4 Theorems

The preamble .tex file defines some basic theorem names and numbering systems but you can change these as you desire. You can look at the documentation for the amsthm package or look up online information on defining theorems in LaTeX for guidance.

The basic set up used here lets you define theorems that use the chapter as the root number, corollaries that take the last theorem as their root, and lemmas that are numbered in the same ordering as theorems, just with a different name.

Theorem 1.1. *Mathematics is wonderful.*

You can use square brackets to add a name to a theorem.

Theorem 1.2 (Physics)**.** *Physics is brilliant.*

As with equations, you can use `label` to reference a theorem. For example, theorem 1.2 is true and leads to corollary 1.2.1.

Corollary 1.2.1. *Physics is worth studying.*

Here we see the lemma environment continuing with the same number system as the theorems. This behaviour can be changed by modifying the relevant part of the preamble.

Lemma 1.3. $1 + 1 = 2$

Proof. In the proof environment your text is preceded by the italicized word proof and ended by a QED symbol. You can customize its appearance if desired. Look up online documentation to see examples of how. □

1.5 Figures

We can display figures with a caption as seen below. Sizes and positions can be controlled in various different ways so consult an online guide for more possiblities. Captions are defined using the `\caption` command. The first argument placed inside square brackets is the short caption which is used only in the List of Figures. The full caption inside the curly braces is displayed below the figure along with the numerical label of the figure in bold. See documentation on the caption package for more options.

Labels and references work as elsewhere. For example, we can write: the original hypothesis is clearly supported by the data shown in figure 1.1...

This is a small example of what can be done with graphics. There is a huge amount of content available online on figure formatting, including full page figures, subplots, figures wrapped with text and text overlays that may be helpful in maximising the clarity with which you present your data.
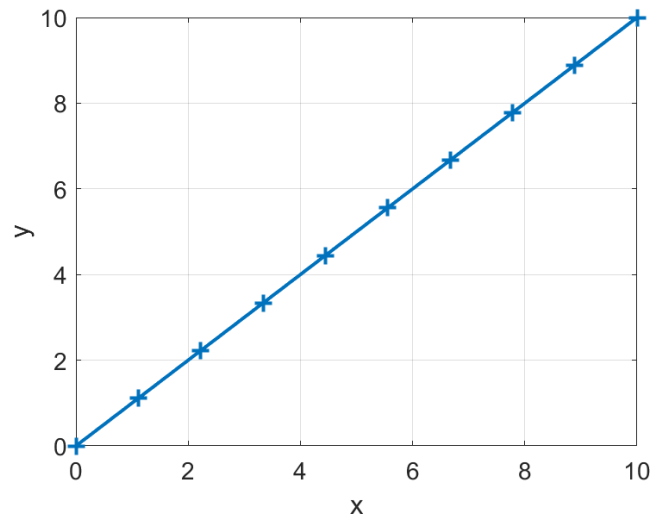
Figure 1.1: Plot of $y = x$. Here y represents the really important data and the trend line has been determined using method A.

1.6 Lists

Lists can be created either in the form of bullet points, such as in Section 1.6.1, or as a numbered list, as in Section 1.6.2.

1.6.1 Bullet point lists

There are several key properties that this physical phenomenon exhibits.

- Property 1.

- Property 2.

- Property 3.

1.6.2 Numbered lists

The steps followed in the measurement were as follows.

1. Step 1.

2. Step 2.

3. Step 3.

There are other features of lists, such as nested lists or controlling the bullet point or numbering style that you can look up online.

1.7 Tables

Use the table environment to create a float that is positioned, labelled and captioned much like figures. The tabular environment is defined inside this to set the style and content of your table. A couple of simple examples are shown here but there are many other options and packages that you can use to customise the appearance.

Table 1.1: Full form table caption placed above the table

A	B	C	D
1	6	λ	v
2	7	α	w
3	8	δ	x
4	9	γ	y
5	10	η	z

Table 1.1 shows some important data while table 1.2 shows the same data in a slightly different form.

A	B	C	D
1	6	λ	v
2	7	α	w
3	8	δ	x
4	9	γ	y
5	10	η	z

Table 1.2: Full form table caption for table with lines dividing columns. Caption placed below table

The `longtable` package can also be used to define tables that span multiple pages. See Chapter 8 where this has been used to create the Thesis with Publications cover page template.

If you need more advanced table functionality, you could explore the `deluxetable` environment[1] for a style used in AAS journals or the `threeparttable` package[2] which has more options to customise table footnotes.

1.8 Citations and Footnotes

You can add both textual and parenthetical references as appropriate — e.g., [1] published an article with very rapid citation rates, but is gradually becoming eclipsed from competition in recent years [e.g., 2–4, to name but a few].

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[1] https://journals.aas.org/aastexguide/#tables
[2] https://www.overleaf.com/learn/latex/Footnotes#Table_notes:_an_alternative_to_footnotes

A basic citation and bibliography style is used in the template but there are a huge number of options to customise this to your liking. Modify the biblatex package line in the preamble to change this.

The university has online guidance about referencing including commonly used formats and the sorts of information that should be included for source material like books and articles. Speak to your supervision team if you are unsure about what referencing style is typically used in your field. The link above (checked as of July 2025) also has resources on how to avoid plagiarism that would be useful to familiarise yourself with.

Add references to the references.bib file to use them. Most journals and reference managers will have options to export a reference in a bibtex format that you can copy into this file.

Footnotes can also be added[3] within your text if required.

You can also refer to other chapters and sections in the thesis by adding a `\label` command at the appropriate point and using `\ref`. For example, a similar method for referencing equations was used in section 1.3. Referencing of subsections was also used in section 1.6.

The default version of this template uses the `biblatex` package to manage citations. If you need to use a .bst file such as the aasjournal style, you need to use a package like `natbib`. The required commands are in the template but commented out so you will need to make a few changes:

1. In preamble.tex, comment out the lines starting `\usepackage[...]{biblatex}`.

2. Just below those lines, uncomment one of the natbib `usepackage` commands depending on your sorting preference (numeric or alphabetical).

3. In main.tex, towards the end of the document, comment out the `\printbibliography` line.

4. Just below those lines, uncomment the `\bibliographystyle{aasjournal}` and `\bibliography{references}{}` lines, replacing the bibliography style name if desired.

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[3]This is an example of a footnote

Chapter 2

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 3

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 4

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 5

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 6

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 7

Insert an appropriate chapter title here

Insert your chapter content here...

Chapter 8

Thesis with Publications cover page example

A template for the Thesis with Publications cover page that should be completed for each publication is included on the next page. You may delete this section if you are submitting a standard monograph thesis, however, if you are using substantial parts of published work in a chapter, you should still include a declaration to make this clear. Example text to achieve this is given below:

Note, this chapter was conducted as part of my PhD (20XX-20YY) and first appeared as a published article with the full details of the citation as below:

Author name, "Title of paper," Journal Title, volume, issue (year), page numbers.

This chapter uses content from the published article, with some emendations and changes of phrase used to better elaborate the work and provide additional supporting material.

Type of Publication	- Already published.
	- Accepted for publication.
	- Submitted for publication.
	- Drafted as potential publications.
	(delete as appropriate)
Full Details of Citation (if published)	Include Author name, "Title of paper," Journal Title, volume, issue (year) page numbers.
Journal Title (if submitted or accepted for publication but not yet published)	
Inclusion in Chapter	- This chapter is a word-for-word reproduction of the published article.
	- This chapter is a replication of the publication article with minor revisions.
	- This chapter substantially uses the content of the published article with some emendations and changes of phrase.
	(delete as appropriate)
Statement of Contribution (for co-authored works)	This study was conceived by all of the authors whose permission has been sought and/or granted, evidence of which can be made available on request.
	I carried out *[description of student's contribution to be inserted]*.
Additional Context (if required)	

Post-examination only

If published or accepted for publication prior to original submission:		
Does this chapter now vary from the published article due to changes requested by the examiners?	- Yes	
	- No	
	(delete as appropriate)	
If submitted for publication but not yet accepted prior to original submission:		
Has the publication since been accepted or published?	- Yes, published	
	- Yes, accepted	
	- No	
	(delete as appropriate)	

Details of Full Citation (if published)	*Include Author name, "Title of paper" Journal Title, volume, issue (year) page numbers.*
Does this chapter now vary from the published or accepted article due to changes requested under the peer review process?	- Yes - No *(delete as appropriate)*

(This cover page should be provided for each publication included in the thesis.)

Insert your chapter content here...

Chapter 9

Conclusions

A final chapter to write up your conclusions.

Bibliography

1. Aad, G. *et al.* Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC. *Physics Letters B* **716,** 1–29. doi:`10.1016/j.physletb.2012.08.020` (2012).

2. Cao, Y. *et al.* Unconventional superconductivity in magic-angle graphene superlattices. *Nature* **556,** 43–50. doi:`10.1038/nature26160` (2018).

3. Tanabashi, M. *et al.* Review of Particle Physics*. *Physical Review D* **98,** 030001. doi:`10.1103/PhysRevD.98.030001` (2018).

4. Ivezić, Ž. *et al.* LSST: From Science Drivers to Reference Design and Anticipated Data Products. *The Astrophysical Journal* **873,** 111. doi:`10.3847/1538-4357/ab042c` (2019).

Appendices

Appendix A

Title of first appendix

Non-essential supplementary information. If you want to control how the appendices appear, such as removing the extra Appendices title page, then modify the options for the appendix package in the preamble.

Appendix B

Title of second appendix

A second appendix in case it is needed.