



Trinity College Dublin
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The University of Dublin

SCHOOL OF COMPUTER SCIENCE AND STATISTICS

TITLE OF WORK

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SUPERVISOR

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*Adapted from a template created by Prof. Michael Brady,
School of Computer Science, TCD
(remove line 45, title.tex)*

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
M.SC. STATISTICS AND SUSTAINABILITY

Declaration

I hereby declare that this Thesis is entirely my own work and that it has not been submitted as an exercise for a degree at this or any other university.

I have read and I understand the plagiarism provisions in the General Regulations of the University Calendar for the current year, found at <http://www.tcd.ie/calendar>.

I have also completed the Online Tutorial on avoiding plagiarism 'Ready Steady Write', located at <http://tcd-ie.libguides.com/plagiarism/ready-steady-write>.

Signed: _____

Date: _____

Abstract

A short summary of the problem investigated, the approach taken and the key findings. This should not be more than around 400 words.

The must be on a separate page.

what's the title for our title abstract one page five paragraphs area and digital twin project research questions two paragraphs how to solve them paragraph to implement and evaluate main findings one paragraphs expanding the abstract

introduction literature review design implementation evaluation conclusion

Acknowledgements

Thanks Mum!

You should acknowledge any help that you have received (for example from technical staff), or input provided by, for example, a company.

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Nomenclature

A	Area of the wing	m^2
B		
C	Roman letters first, with capitals. . .	
a	then lower case.	
b		
c		
Γ	Followed by Greek capitals. . .	
α	then lower case greek symbols.	
β		
ϵ		
TLA	Finally, three letter acronyms and other abbreviations arranged alphabetically	

If a parameter has a typical unit that is used throughout your report, then it should be included here on the right hand side.

If you have a very mathematical report, then you may wish to divide the nomenclature list into functions and variables, and then sub- and super-scripts.

Note that Roman mathematical symbols are typically in a serif font in italics.

1 | Introduction - Chapter

1.1 Section

1.1.1 Subsection

Paragraph

Subparagraph

1.1.2 Subsection

Subsubsection

1.2 Aims

2 | Literature Review

2.1 Materials

2.2 Synthetic Procedures

2.2.1 Parameters Varied

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3 | Experimental Methods

3.1 Materials

3.2 Synthetic Procedures

3.2.1 Parameters Varied

3.3 Characterisation Techniques

3.3.1 A

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4 | Results and Discussion

5 | **Conclusions and Future Work**

6 | Figures, Tables, Referencing

It is very important to properly refer in the text to any figures, tables or previously published work that you are discussing. Adequate and consistent referencing is one of the criteria which will be used to assess your project report.

6.1 Figures

Graphs, pictures and other images should be included in your report as a numbered, captioned figure. An example is given in Figure 6.1.

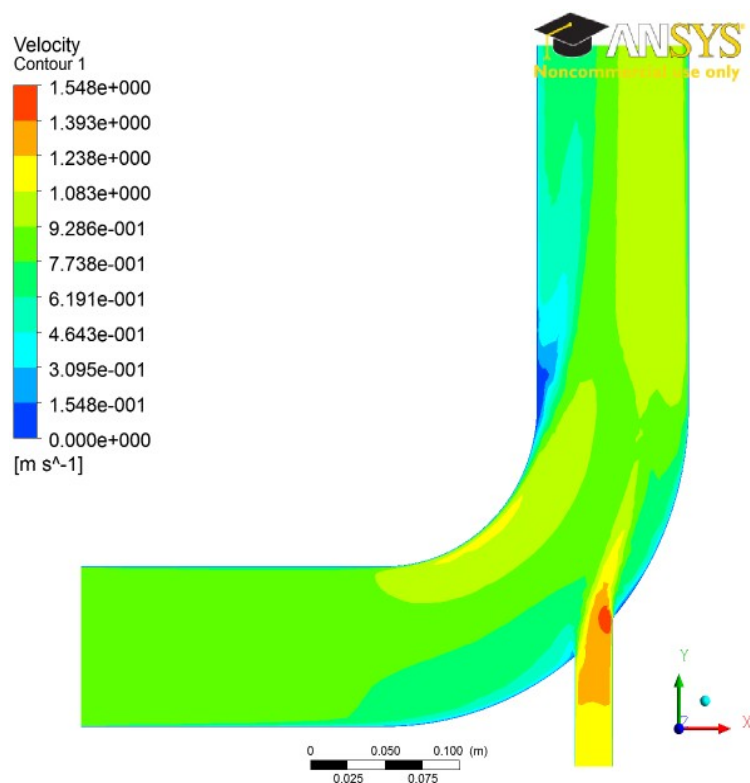


Figure 6.1: Velocity distribution on the mid-plane for an inlet velocity for case 1.

The figure and caption should be centred. The figure numbering starts at 1 at the beginning of each chapter. The caption should provide a brief description of what is being shown. The figure should appear in the document after it is referred to in the text. No figure should be included which is not referred to in the text. Ensure that the size and resolution of images imported from software are sufficient to read any text.

6.2 Tables

Tables are an important way of displaying your results. Table 6.1 is a sample table, adapted from the Master/Doctoral Thesis template at <http://www.latextemplates.com/cat/theses>, which was generated with this code:

```
\begin{table}[b]
\caption{The effects of treatments X and Y on the four groups studied.}
\label{tab:treatments}
\centering
\begin{tabular}{l l l}
\toprule
\textbf{Groups} & \textbf{Treatment X} & \textbf{Treatment Y} \\ \midrule
1 & 0.2 & 0.8 \\
2 & 0.17 & 0.7 \\
3 & 0.24 & 0.75 \\
4 & 0.68 & 0.3 \\
\bottomrule
\end{tabular}
\end{table}
```

Tables are numbered in the same way as figures. Typically tables also have a short caption, but this is not universally true. The number and caption appear above the table, not below as with figures. Again, no table should appear in the report which has not been referred to in the text. Tables should come after they are discussed in the

text. The exact formatting of the table depends somewhat on the content of the table, but in general, the text in the table should be the same font and size as the main text.

6.3 Equations

All equations should be numbered sequentially. Do not restart the numbering at the beginning of each chapter. Unlike figures and tables, you may not need to refer to every equation in the text. You should take care to format equations properly. Do not simply try to use plain text. Use the equation layout facilities. An example of how equations should appear is shown in Equation 1. Here is the code for it:

```
\begin{equation}
\text{trm{div}}(\underline{u}) = \frac{\delta u}{\delta x} + \frac{\delta v}{\delta y} +
\frac{\delta w}{\delta z} = 0
\label{sampleequation}
\end{equation}
```

$$\text{div}(\underline{u}) = \frac{\delta u}{\delta x} + \frac{\delta v}{\delta y} + \frac{\delta w}{\delta z} = 0 \quad (1)$$

6.4 Referencing published work

It is important to give appropriate credit to other people for the work that they have shared through publications. In fact, you must sign a declaration in your report stating that you understand the nature of plagiarism. As well as avoiding plagiarism,

Table 6.1: The effects of treatments X and Y on the four groups studied.

Groups	Treatment X	Treatment Y
1	0.2	0.8
2	0.17	0.7
3	0.24	0.75
4	0.68	0.3

citing results or data from the literature can strengthen your argument, provide a favourable comparison for your results, or even demonstrate how superior your work is.

There are many styles to reference published work. For example, the parenthetical style (which is also called the *Harvard style*) uses the author and date of publication (e.g. "Smith and Jones, 2001"). There is also the Vancouver style (or the *citation sequence style*), which is used in this document. In the Vancouver style, the publications are cited using bracketed numbers which refer to the list in the References section at the end of the report. The references are listed in the order that they are cited in the report. A variant is *name sequence style*, in which the publications are referenced by number, but the list is arranged alphabetically. The following paragraph shows the use of the Vancouver style:

Several studies have examined the sound field around tandem cylinders generated by flow(1, 2), while other investigations have focused on the effect of an applied sound field on the flow(3). Papers from conference proceedings(4), books(5) and technical reports(6) can be dealt with in the same style.

The Vancouver style has the advantage that it is a little more compact in the text and does not distract from the flow of the sentence if there are a lot of citations. However, it has the disadvantage that it is not immediately clear to the reader what particular work has been referenced.

It actually does not matter which particular referencing style is used as long as three important considerations are observed:

- the referencing style used throughout the document is consistent;
- all material used or discussed in the text is properly cited;
- nothing is included in the reference list that has not been cited.

This template has a suitable referencing style already set up – you should use it and

use the built-in BibTeX system to manage your references. See above for examples of how to cite a reference and look in the `sample.bib` file to see BibTeX references. Remember Google Scholar and other search engines will give you BibTeX references for lots of academic publications. Otherwise, you can easily make up your own based on the examples in that file.

7 | L^AT_EX

L^AT_EX, or more properly “L^AT_EX 2_ε”, is a very useful document processing program. It is very widely used, widely available, stable and free. Famously, T_EX, upon which L^AT_EX is built, was originally developed by the eminent American mathematician Donald Knuth because he was tired of ugly mathematics books (7). Although it has a learning curve (made much less forbidding by online tools and resources – see below), it allows the writer to concentrate more fully on the content, and takes care of most everything else.

While it can be used as a word processor, it is a *typesetting* system, and Knuth’s idea was that it could be used to produce beautiful looking books:

L^AT_EX is a macro package which enables authors to typeset and print their work at the highest typographical quality, using a predefined, professional layout.¹

L^AT_EX has great facilities for setting out equations and a powerful and very widely supported bibliographic system called BibT_EX, which takes the pain out of referencing.

Three useful online resources make L^AT_EX much better:

- (1) An excellent online L^AT_EX environment called “Overleaf” is available at <http://www.overleaf.com> and runs in a modern web browser. It’s got this template available – search for a TCD template. Overleaf can work in conjunction with Dropbox, Google Drive and, in beta, GitHub.

¹This is from Oetiker et al. (8). Did we mention that you should minimise your use of footnotes?

(2) Google Scholar, at <http://scholar.google.com>, provides BibTeX entries for most of the academic references it finds.

(3) An indispensable and very fine introduction to using L^AT_EX called "*The not so short introduction to L^AT_EX 2 ϵ* " by Oetiker et al. (8) is online at <https://doi.org/10.3929/ethz-a-004398225>. Browse it before you use L^AT_EX for the first time and read it carefully when you get down to business.

Other tools worth mentioning include:

- Draw.io – an online drawing package that can output PDFs to Google Drive – see <https://www.draw.io>.

Bibliography

- [1] JA Fitzpatrick. Flow/acoustic interactions of two cylinders in cross-flow. *Journal of Fluids and Structures*, 17(1):97–113, 2003.
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- [4] Peter Jordan, John Fitzpatrick, and Craig Meskell. Array beam pattern control for measurement of propeller noise. In *AIAA/CEAS Aeroacoustics Conference and Exhibit, Maastricht, Netherlands*, 2001.
- [5] Michael P Paidoussis, Stuart J Price, and Emmanuel De Langre. *Fluid-structure interactions: cross-flow-induced instabilities*. Cambridge University Press, 2010.
- [6] L Reyes. Power uprate program status report-secy-07-0090. Technical report, Technical Report, US Nuclear Regulatory Commission, 2007.
- [7] Len Shustek and Donald Interviewee-Knuth. Interview donald knuth: A life’s work interrupted. *Communications of the ACM*, 51(8):31–35, 2008.
- [8] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl. The not so short

introduction to latex 2 ϵ . *Electronic Document*, 2001.

<http://www.tex.ac.uk/tex-archive/info/lshort>.

A1 | Appendix

You may use appendices to include relevant background information, such as calibration certificates, derivations of key equations or presentation of a particular data reduction method. You should not use the appendices to dump large amounts of additional results or data which are not properly discussed. If these results are really relevant, then they should appear in the main body of the report.

A1.1 Appendix numbering

Appendices are numbered sequentially, A1, A2, A3... The sections, figures and tables within appendices are numbered in the same way as in the main text. For example, the first figure in Appendix A1 would be Figure A1.1. Equations continue the numbering from the main text.