FULL TITLE OF THESIS/DISSERTATION IN ALL UPPERCASE LETTERS (AUTOMATICALLY DONE) AND NO BOLD, SAME FONT SIZE AS TEXT, LONG TITLES SHOULD BE SINGLE SPACED

by

Student Full Name

A Thesis

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Science

Major: Mechanical Engineering

The University of Memphis

May 2024

Dedication

The dedication of your thesis/dissertation is an optional section that comes before the main text. If you choose not to include the dedication in your document, you can simply delete the this paragraph including beginning and ending of `dedication` environment.

Acknowledgments

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Preface

The preface of your thesis/dissertation is an (uncommon) optional section that comes before the main text. If you choose not to include the preface in your document, you can simply delete the this paragraph including beginning and ending of `preface` environment.

Abstract

The abstract is a brief summary of the main ideas and conclusions of your thesis or dissertation. It is required section and it should be placed here. The abstract should provide a clear and concise overview of your research question, methodology, results, and conclusions. It is important to carefully craft your abstract, as it will often be the first part of your document that readers will see and will help them decide whether to read on.

Keywords: Computational Fluid Dynamics, Reynolds Equation, Lubrication, Tribology, Cavitation, Hydrodynamics, Spectral Element Methods

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Key to Symbols

ψ_1	Output 1 [m/s]
ψ_2	Output 2 [m/s]
x_1	Input 1 [m]
x_2	Input 2 [m]

Abbreviations

CFD Computational Fluid Dynamics
UofM University of Memphis

Chapter 1

Introduction

The primary objective of this LaTeX template is to offer guidance and support to the students of the University of Memphis (UofM) who have chosen to write their thesis or dissertation using LaTeX. This template provides an excellent starting point for students who are new to LaTeX or who wish to streamline their writing process. However, it is important to note that while this LaTeX template can serve as a helpful framework for writing theses and dissertations, it may not fully comply with the specific formatting and style requirements of the UofM. Therefore, it is the sole responsibility of the individual student to thoroughly review and adhere to the UofM Thesis/Dissertation Style and Formatting Guidelines.

Chapter 2

Chapter Title Using Title Case

The main content of the thesis or dissertation should be placed here. All running text should be left-justified. The right edge of the paragraphs should be ragged, and all paragraphs should be indented, including the first paragraph.

Chapters in the thesis or dissertation should be numbered (e.g., Chapter 1, Chapter 2, etc.). However, sections or subsections should not be numbered unless specifically approved by the committee members. If numbering is desired for sections or subsections, a justification must be submitted. Examples of numbering for sections or subsections include 1.1 or 1.1.1. To enable numbering sections and subsections, you can change the `nosecnum` option to the `secnum` in the `\documentclass` option lists.

Section Title

`\section` command can be used to create a section inside a chapter. The title of the section should be formatted in Title Case, which means that the first letter of each major word in the title should be capitalized.

Sub-Section Title

`\subsection` command can be used to create a sub-section inside a section. The title of the sub-section should be formatted in Title Case, which means that the first letter of each major word in the title should be capitalized.

Sub-sub-section title

`\subsubsection` command can be used to create a sub-sub-section inside a sub-section. The title of the sub-sub-section should be formatted in Sentence case, which means that only the first letter of the first word in the title should be capitalized, unless there are proper

nouns or acronyms that require capitalization. This helps to distinguish the sub-sub-section from the sub-section and the section, and makes the document easier to read and navigate. However, it is generally not recommended to use sub-sub-sections, as they can make the document overly complex and difficult to navigate. In most cases, a clear hierarchy of sections and sub-sections is sufficient to organize the content effectively.

How to Cite Articles, Proceedings Papers, Books, and Tech Reports

It is convenient to use BibTeX to cite references in the text. Citation of an article can be inserted with `\cite{key}` command. This command will add the bracket number of the reference, e.g., [1]. Multiple citation can be printed using the dash with the same command with comma-separated parameters: `\cite{key1,key2,key3}`, given as: [1–3]. List of references are printed at the end of the main thesis/dissertation content.

Equations, Tables, Figures, and Cross-References

Equations

Equations can be written with `equation` environment. Equations can be labeled and cross-referred in the text, via `\eqref{}` command, such as: Eq. (1), given as:

$$\begin{bmatrix} \psi_1 \\ \psi_2 \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \left(\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \circ \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \right) + \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}, \tag{1}$$

where ψ_1 and ψ_2 are output variables, and x_1 and x_2 are input variables. The command `\eqref{}` references equation number with a pair of parenthesis. When the equation is referred at the beginning of the sentence, use `Equation~\eqref{eq:label}`. Otherwise, use `Eq.~\eqref{eq:label}`. For example, the linear equation given as Eq. (1) is referred in the sentence with abbreviation. Equation (1), however, is not abbreviated because it is referred at the beginning of the sentence.

Table 1: Example of very very long table caption. Explanatory captions are widely used in some fields. However, for the thesis/dissertation writing, try to explain everything in the main text rather than in the caption. Long table caption makes the list of tables too crowded. Explanatory captions should have a period at the end of each sentence.

First	Second	Third Column
1	4	7
2	3	6
3	5	12

Multiple equations can be aligned together with `align` environment, given as:

$$g_{\mu\nu} = [S1] \times \mathrm{diag}\left(-1, +1, +1, +1\right) \tag{2}$$

$$R^{\mu}_{\alpha\beta\gamma} = [S2] \times \left(\Gamma^{\mu}_{\alpha\gamma,\beta} - \Gamma^{\mu}_{\alpha\beta,\gamma} + \Gamma^{\mu}_{\alpha\beta}\Gamma^{\sigma}_{\gamma\alpha} - \Gamma^{\mu}_{\sigma\gamma}\Gamma^{\sigma}_{\beta\alpha}\right) \tag{3}$$

$$G_{\mu\nu} = [S3] \times \kappa T_{\mu\nu} \tag{4}$$

These multiple equations can be referred together, such as Eqs. (2)-(4), or referred individually, such as Eq. (3). Multiple equations with subordinate equation numbering can be achieved by adding `subequations` wrapper outside of `align` environment, given as:

$$g_{\mu\nu} = [S1] \times \mathrm{diag}\left(-1, +1, +1, +1\right) \tag{5a}$$

$$R^{\mu}_{\alpha\beta\gamma} = [S2] \times \left(\Gamma^{\mu}_{\alpha\gamma,\beta} - \Gamma^{\mu}_{\alpha\beta,\gamma} + \Gamma^{\mu}_{\alpha\beta}\Gamma^{\sigma}_{\gamma\alpha} - \Gamma^{\mu}_{\sigma\gamma}\Gamma^{\sigma}_{\beta\alpha}\right) \tag{5b}$$

$$G_{\mu\nu} = [S3] \times \kappa T_{\mu\nu} \tag{5c}$$

This group of equations can be referred together, such as Eq. (5), or referred individually, such as Eq. (5b).

Tables

Tables can be created using the `tabular` environment nested inside a `table` environment. It is required to use the center alignment command (`\centering`) and the table

Table 2: Example of standard table caption without a period at the end

First	Second	Third Column
1	4	7
2	3	6
3	5	12

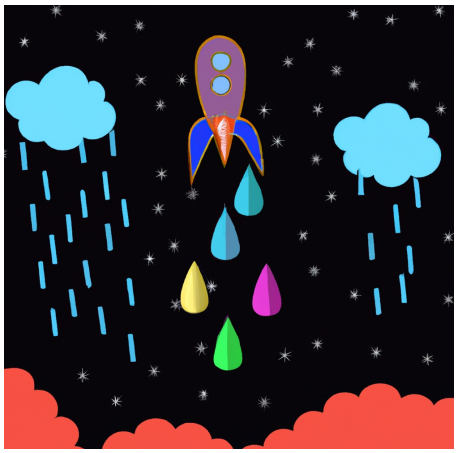
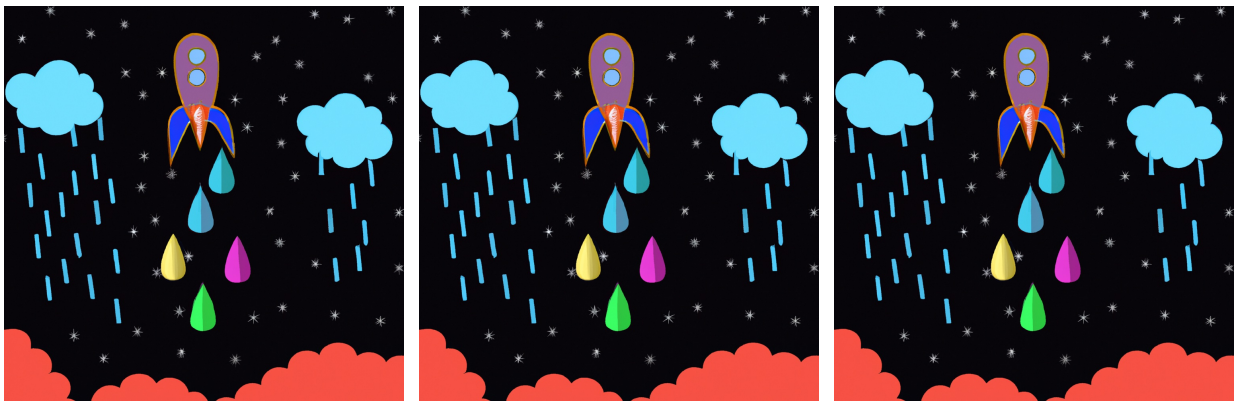


Figure 1: Caption of the single-image figure [3]

caption command (`\caption`) before the `tabular` environment, as directed in the style guidelines. To create professionally styled tables, consider using the booktabs rule commands, such as `\toprule`, `\midrule`, `\bottomrule`, or `\cmidrule`.

For example, Tab. 1 has a long caption, while Tab. 2 has a standard caption. It is generally not recommended to use long captions because they can make the list of tables too crowded. Instead, explanations can be given in the main text of the document. However, if a long caption is needed, each sentence used in the long caption should end with a period.

If table is mentioned in the middle of a sentence, use the abbreviation Tab. For example, Tab. 1 should be used instead of Table 1. Full name “Table” should be used only if it is mentioned at the beginning of a sentence.



(a) First sub-image (b) Second sub-image (c) Third sub-image

Figure 2: Caption of the figure of multiple images

Figures

Figures can be created using the `includegraphics` environment nested inside a `figure` environment, as given in Fig. 1. Unlike tables, it is required to use the center alignment command (`\centering`) before the `includegraphics` environment, and the table caption command (`\caption`) after the `includegraphics` command as directed in the style guidelines. It is recommended to place images in subfolders, such as `./images/`, to organize files. Placing images in the root folder is not a good idea. You may also use the `\subcaptionbox` command to place multiple images in a figure, as given in Fig. 2.

Abbreviations, Symbols, and Glossaries

Use of Abbreviations

The `\gls{key}` command can be used to automate the use and expansion of abbreviations, when a full definition of the `key` is defined in the `abbrev.tex` file, using the `\newacronym{key}{short}{long}` command. It provides a full definition for the first usage of the acronym in the text. After the initial appearance, the same `\gls` command will only print the acronym. For example, the first time we use `\gls{cfd}` in the text will show

Computational Fluid Dynamics (CFD). Any subsequent uses of `\gls{cfd}` will show only CFD since the full definition has already been provided earlier in the text. This feature can save writing effort and improve readability by avoiding the repetition of lengthy phrases. All acronym definitions should be stored in the `abbrev.tex` file.

Use of Symbols

The same `\gls{key}` command can be used to print symbol in the text, when a full definition of the `key` is defined in the `symb.tex` file. The full definition of the symbol can be defined with the `\newsymb{key}{math}{desc}` command.

For example, we can define variables used in an equation, given as:

$$\psi_1 = x_1 + x_2, \tag{6}$$

where `\gls{psi1}` is output, `\gls{x1}` is the first input, and `\gls{x2}` is the second input variables of the system. Then, the definitions given here will read:
where ψ_1 is output, x_1 is the first input, and x_2 is the second input variables of the system. Full definitions of all used symbols will appear in the Key to Symbols list in the preliminary pages.

Use of Glossaries

Glossaries can be used with the same `gls{key}` command. Full definition of the term will not appear in the main text, but they will be only defined in the Glossaries section at the end of the document. The full definition of the glossary entry can be defined with the `\newglo{key}{term}{desc}` command, in the `glo.tex` file. For example, here's a sentence using two glossary entries: "`\Gls{maths}` is important in `\gls{sci}`." This sentence will read: "Mathematics is important in science."

Command `\Gls` will capitalize the first character. For example, `\Gls{sci}` prints "Science," while `\gls{sci}` prints "science." Command `\glspl` will print plural of the term.

For example, `\glspl{scientist}` will print "scientists."

Cross-Referencing Chapters, Tables, Figures, and Equations

Cross-referencing is possible if entries are numbered and labeled. For example, chapters are all numbered. You may label chapters with `\label{key}` command and refer to the chapter using `\ref{key}` command. For example, since the first chapter is already labeled with `\label{chap:intro}` command, we can refer to this chapter with `Chap.~\ref{chap:intro}` command. It will print as "Chap. 1." Use "Chapter" instead of "Chap." only if it is located at the beginning of a sentence. You may also cross-refer other items, including tables and figures. For example, `Tab.~\ref{tab:table-with-long-title}` will print "Tab. 1," and `Fig.~\ref{fig:single}` will print "Fig. 1." You may use "Table" and "Figure" if they are mentioned at the beginning of a sentence.

Equations are referred using `\eqref{key}` to show parenthesis. For example, `Eq.~\eqref{eq:mtw-signs-subeq}` will print "Eq. (5)." If you want to refer to multiple subsequent equations, you may refer the first and last equations, e.g., `Eqs.~\eqref{eq:mtw-sign-subeq1}-\eqref{eq:mtw-sign-subeq3}`. This command will print "Eqs. (5a)-(5c)."

With the default `nosecnum` option, sections will not be numbered. In this case, referring section is not possible. If sections need to be referred, consider using `secnum` option with committee approval. With this option, you may label sections and cross-refer them with `Sect.~\ref{sect:labelname}` command.

Glossary

mathematics Mathematics is what mathematicians do
science Science is what scientists do
scientist Scientist is a person who does science

References

[1] D. E. Knuth, The errors of TEX, Software, Practices and Experience 19 (7) (1989) 607–685. doi:10.1002/spe.4380190702.

[2] R. Jin, W. Chen, A. Sudjianto, An efficient algorithm for constructing optimal design of computer experiments, Journal of Statistical Planning and Inference 134 (1) (2005) 268–287. doi:10.1016/j.jspi.2004.02.014.

[3] S. F. Name, Title of the article still in review, Journal of Computational Physics, In review.

Appendix A

Chapter Title for the First Appendix

When you create a chapter within the `appendix` environment, it will be automatically numbered with the prefix ”Appendix A,” ”Appendix B,” and so on. You may create as many appendix chapters as needed. The page numbers in the appendix will continue from the last page number of the main text.

Appendix B

Chapter Title for the Second Appendix

The appendix typically includes materials that are not essential to the main text but provide additional information or support for the research. Some common examples of content that may go in the appendix include:

1. Raw data: This can include surveys, interviews, or other types of data that were collected during the research process but are too lengthy or detailed to include in the main text.

2. Supplementary graphs or charts: These can provide additional information or support for the research, but may be too lengthy or detailed to include in the main text.

3. Technical details: This can include detailed calculations, algorithms, or computer code that are not essential to the main text but may be of interest to readers.

4. In-depth analysis: This can include detailed statistical analyses or other types of analysis that are not essential to the main text but provide additional support for the research.

5. Other materials: This can include any other materials that are relevant to the research but are not essential to the main text, such as photographs or illustrations.