DEPARTMENT OF AEROSPACE
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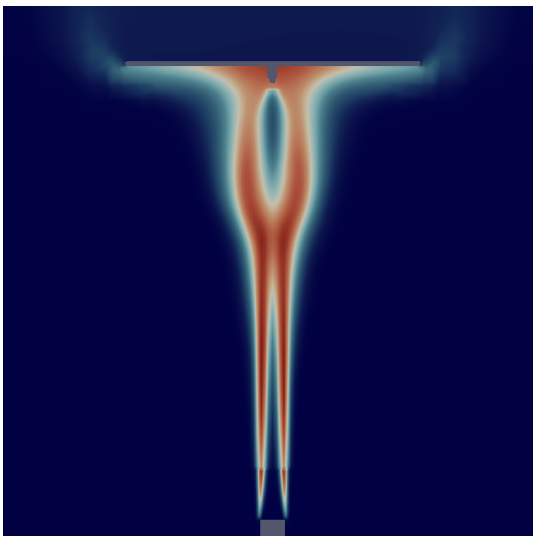
INDIAN INSTITUTE OF TECHNOLOGY
MADRAS
CHENNAI - 600036

A New and Improved LaTeX Class for Dissertations Submitted to IIT Madras



A Thesis

Submitted by

NAME

For the award of the degree

Of

DOCTOR OF PHILOSOPHY

Sep 2021

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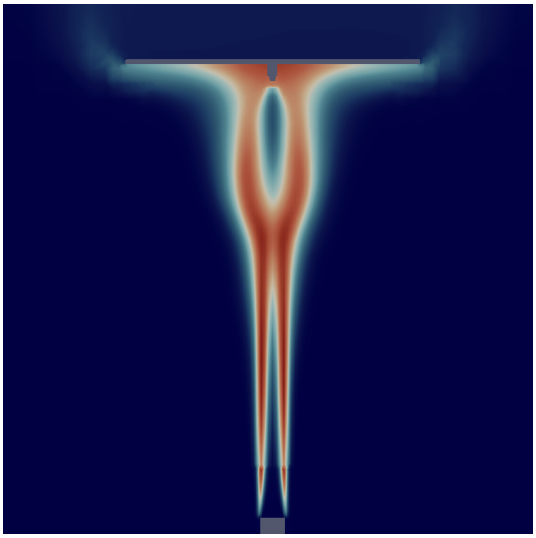

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QUOTATIONS

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
I hold with those who favor fire.
But if it had to perish twice,
I think I know enough of hate
To say that for destruction ice
Is also great
And would suffice.

ROBERT FROST

DEDICATION

To my beloved

THESIS CERTIFICATE

This is to undertake that the Thesis (or Project report) titled **A NEW AND IMPROVED LaTeX CLASS FOR DISSERTATIONS SUBMITTED TO IIT MADRAS**, submitted by me to the Indian Institute of Technology Madras, for the award of <Ph.D./M.S.>, is a bona fide record of the research work done by me under the supervision of <Name(s) of the Research Guide(s)>. The contents of this Thesis (or Project report), in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

In order to effectively convey the idea presented in this thesis, the following work of other authors was reprinted in the thesis with their permission. In case if you have extensive referencing here or if the page length is exceeded please share the same in an appendix, and word it as: 'In order to effectively convey the idea presented in this thesis, the work of other authors was reprinted in the thesis with their permission, as described in Appendix - X, images from internet were taken, as discussed in Appendix -B'

- Figures, Tables from previously published journal papers, to be referenced in the following way:
  - Figure/Table XX, page yy: Reprinted from... <Ref details>...with the permission of the authors and/or Publisher name. An example has been provided in the next point for the IIT Madras logo
  - Figure 1.1, page 6: Within the purposes of the organisation under Fair and Non-free usage policy. ©IIT Madras

- Images taken from the internet, to be referenced in the following way:
  - Photograph by < (name of photographer), distributed under a CC-BY 40 license.

Place: Chennai 600 036

Date: 20th Sep 2021

Name

Research Scholar

Prof. 1

Research Guide

LIST OF PUBLICATIONS

I. REFEREED JOURNALS BASED ON THE THESIS

1. Authors.... Title... *Journal*, Volume, Page, (year).

II. REFEREED JOURNALS (Others)

III. PRESENTATIONS IN CONFERENCES

1. Authors.... Title... *Conference*, Page, (year).

IV. PUBLICATIONS IN CONFERENCE PROCEEDINGS

ACKNOWLEDGEMENTS

Thanks to all those who made TEX and LATEX what it is today.

ABSTRACT

KEYWORDS: LaTeX; Thesis; Style files; Format.

A LaTeX class along with a simple template thesis are provided here. These can be used to easily write a thesis suitable for submission at IIT-Madras. The class provides options to format PhD, MS, M.Tech., Dual Degree and B.Tech. thesis. It also allows one to write a synopsis using the same class file. Also provided is a BIBTeX style file that formats all bibliography entries as per the IITM format.
The formatting is as (as far as the author is aware) per the current institute guidelines.

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GLOSSARY

The following are some of the commonly used terms in this thesis:

OpenFOAM An opensource C++ toolbox for the development of customized numerical solvers, and pre-/post-processing utilities for the solution of continuum mechanics problems, most prominently including computational fluid dynamics

CFD A branch of fluid mechanics that uses numerical analysis and data structures to analyze and solve problems that involve fluid flows

FireFOAM FireFOAM is a CFD solver used for LES modeling of fire and its suppression in the OpenFOAM

ABBREVIATIONS

IITM	Indian Institute of Technology Madras
NCCRD	National Centre for Combustion Research and Development
RTFM	Read the Fine Manual

NOTATION

English Symbols

R_E	Radius of the earth
R_u	Universal Gas Constant

Greek Symbols

α	Angle of thesis in degrees
β	Flight path in degrees

Miscellaneous

$\|x\|$	Absolute value of x
$‰$	Per-mille (or per thousand)

CHAPTER 1

INTRODUCTION

This document provides a simple template of how the provided `iitmdiss.cls` LaTeX class is to be used. Also provided are several valuable tips for doing various things that might be useful when writing your thesis. The source code is present on my Github page (Syed, 2019–), which can help cite the contribution of this work and raise any issues or bugs encountered within this template.

1.1 TEMPLATE VERSION, FORMATTING GUIDELINES AND COMPLIANCE

I have standardized the template in compliance with the new format guidelines released in Feb 2021, and later with the updated guidelines of July 2021. Please cross-check these with the IITM academic website.

Before reading any further, please note that you are strongly advised against changing any of the formatting options used in the class provided in this directory unless you are absolutely sure that it does not violate the IITM formatting guidelines. *Please do not change the margins or the spacing.* Despite these warnings, if you do change the formatting, you are on your own (do not blame me if you need to reprint your entire thesis). The least I ask is that you do not redistribute your style/class files to your friends (or enemies).

1.1.1 Licensing and Responsibility

Also, since we are talking about the responsibility here, like any other piece of freely distributable code, this template and other files within this folder are provided "as is." There is no guarantee of any kind from the author. In short, that means it is your personal responsibility to make sure the template is compliant with the guidelines, and I cannot be held responsible.

It is also a good idea to take a quick look at the formatting guidelines. In fact, I would strongly suggest you go through them even before you venture into the present

template. They are included in a separate folder along with other proformas required while submitting your synopsis or thesis for convenience. Also, your office or advisor should have a copy of these guidelines with them. If they do not, pester them, as they really should have the latest formatting guidelines readily available somewhere.

1.2 BASIC USER GUIDE

1.2.1 Structure of the Template

The files provided serves as a minimal templates to start formating your synopsis, proformas, thesis or individual chapters. Of these, only `synopsis.tex` is a single tex file. All other templates have sub-folders and sub-files attached to them for ease-of-usage and to catch errors during TEXcompilation and debugging.
For `thesis.tex`, there are five sub-folders of which `C_chap` and `D_appx` handle contents of your thesis. The rest of the sub-folders are meant to format and create different types of thesis pages that include cover pages, tables of content, CV etc. Please go through each of these sub-folders and sub-files starting from the main file `thesis.tex` and down the file hierarchy for a better understanding before using the template.

1.2.2 Compilation

To compile your sources, run the following from the command line:

```
% latex thesis.tex
% bibtex thesis
% latex thesis.tex
% latex thesis.tex
```

Modify this suitably for your sources. To generate PDFs with the links from the `hyperref` package, use the following command:

```
% dvipdfm -o thesis.pdf thesis.dvi
```

You can also use pdflatex to generate the PDF file directly from terminal

Alternatively, you can use standard TEXenvironments like TEXStudio, TEXMaker, etc., to make this process much simpler with just click-based compilation/re-compilation.

1.2.3 Basic Options

The files provided serve as a minimal template to start formating your synopsis, thesis, proformas and individual chapters. The `iitmdiss` class can be used by simply with the following lines in your TEXfile:

```
\documentclass[PhD]{iitmdiss}
```

Print Form

For getting a print form of the same thesis, with the chapters starting on the right side, and appropriate blank pages wherever necessary, add the option `PrntForm` like:

```
\documentclass[PhD,PrntForm]{iitmdiss}
```

Color Bar option

There are also default color bars on the left side of title page in the new format. For the Ph.D. thesis, the default would be black, and for the MS thesis, it is cyan-blue. As for other programmes, there have not been any specific guidelines for making the title page, so black has been set as default. There is also 'NoColor' option you can give not to print this color bar.

```
\documentclass[PhD,PrntForm,NoColor]{iitmdiss}
```

Degree option

To change the title page for different degrees just change the option from `PhD` to one of `MS`, `MTech`, `DD`, `MBA`, `MSc` or `BTech`. The other specific degrees are not supported yet. However, they should be quite easy to add if you look at the code used to generate the above degree pages in `iitmdiss.cls` file. The title page formatting depends on how large or small your thesis title is. Consequently, it might require some hand-tuning. Edit the options in the `iitmdiss.cls` file for it to suitably do this. I recommend doing this as a first step once your title is final.

Cover Image

The new format has an option to include a visually appealing figure/image from your thesis. I have given the file name as `titleImage.png` for this sample image from my work. So if you are planning to use it, place that image file in png format with the main folder and rename it as `titleImage.png`.
Nevertheless, if you are not happy with this concept and want to include custom image formats or the file name of your image/figure, I would suggest editing the `iitmdiss.cls`. You should be comfortable in LaTeXcode for doing so. Look for `titleImage` string, and start editing there.

Synopsis option and Color bar

To write a synopsis, use the `synopsis.tex` file as a simple template. The synopsis option turns this on and can be used as shown below:

```
\documentclass[PhD,synopsis]{iitmdiss}
```

For synopsis, the concept of 'Blue' or 'Yellow' tape to represent the draft and approved reports must be reflected on the title page of respective documents in the new guidelines. Remember that there is a compliance-checking staff at the DR office who would ensure you submit it with the proper color coding. Else, you might have to re-make and re-submit the report again. Options to give would be 'BlueTape' or 'YellowTape' and can be used as shown below:

```
\documentclass[PhD,synopsis,BlueTape]{iitmdiss}
```

Like the thesis, there is a 'NoColor' option for the synopsis, but it will not be that useful. Also, the default option gives a black color bar.

Line Spacing and Indentation

All the text formating is based on the institute guidelines with double spacing (except for pointers, footnote or endnote) and no indentation of paragraphs. So please do not modify them to make your paragraphs small or large.

Suppose you want to modify the spacing between the lines/text of the title page (and inside cover page) which is sometimes needed, and if you are familiar with LaTeX, you can modify it by editing the `titlePage.tex` file in the main folder. Most of time it requires some minor fine-tuning.

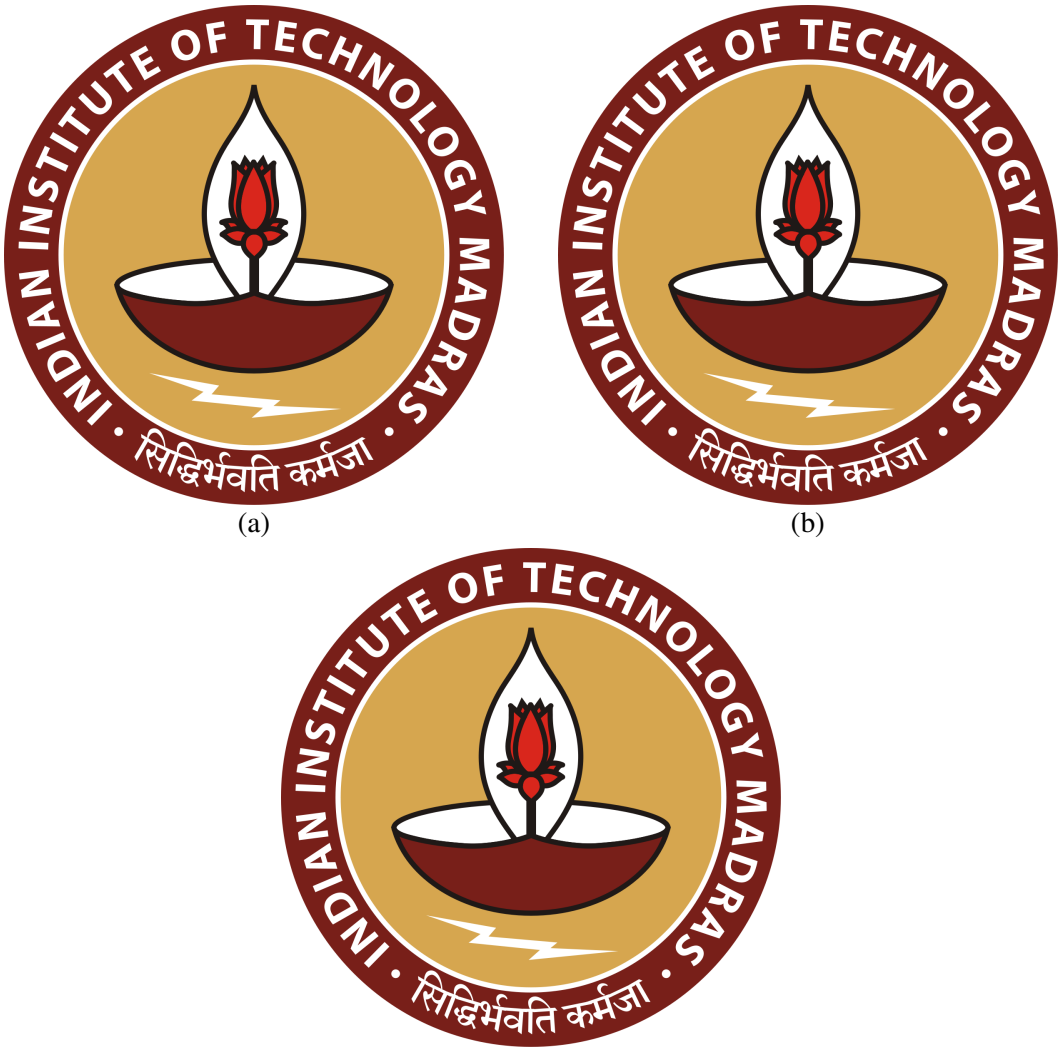
Hyperlinks and Color boxes

This sample file uses the `hyperref` package that makes all labels and references clickable in both the generated DVI and PDF files. These are very useful when reading the document online and do not affect the output when the files are printed.
The color boxes that appear on the hyperlinks are visible only in the Tex environment or if you're using a Linux system. If you try to open it in PDF applications on Windows like Adobe Reader, those color boxes won't show up. Nonetheless, if you want just the hyperlinks without those boxes, you can edit the `01_packages.tex` file from the `0_settings` folder. Search for the line with the `hypertex` package, and add the `hidelinks` option. So the line would become: `\usepackage[breaklinks,hidelinks]{hyperref}`.

1.3 EXAMPLE FIGURE, TABLE AND EQUATION

1.3.1 Sample Figure and Sub-figure

Figure 1.1 shows a simple figure with sub-figures and sub-captions for illustration along with a long caption using `subcaption` package. A sample commented code using `resizebox` has also been given if you prefer to use that instead. Either way, the formatting of caption text is automatically single-spaced and indented.
In the new format, emphasis has been made on the proper copyright compliance when reusing figures/images/tables from other authors and sources. Appropriate attributions and usage policies have to be included within the thesis certificate page. An example has been provided for using the IIT Madras logo as a sample figure in the present template.



(a) (b)

(c)

Fig. 1.1: Two IITM logos in a row and another in the next row (a) One logo, (b) Adjacent logo, and (c) Another logo in the next row. It is also an example of a very long figure caption that wraps around more than two lines. Notice that the caption is single-spaced.

1.3.2 Sample Table and Equation

Table 1.1 shows a sample table with the caption placed correctly. The caption for this should always be placed before the table, as shown in the example. Like figure captions, the text is automatically single-spaced and indented.

Table 1.1: A sample table with its caption placed appropriately. This is also very long and is single-spaced. Also notice how the text is aligned.

x	x^2
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64

The following is an illustration of mathematical equations with proper indexing viz. one that fits a line:

$$\frac{\partial \overline{\rho}}{\partial t} + \frac{\partial (\overline{\rho}\tilde{u}_j)}{\partial x_j} = 0 \tag{1.1}$$

And another which is long and split into two lines:

$$\frac{\partial (\overline{\rho}\tilde{u}_i)}{\partial t} + \frac{\partial (\rho \tilde{u}_i \tilde{u}_j)}{\partial x_j} = -\frac{\partial \overline{p}}{\partial x_i} + \frac{\partial}{\partial x_j}\left(\overline{\rho}(\nu + \nu_{sgs})\left(\frac{\partial \tilde{u}_i}{x_j} + \frac{\partial \tilde{u}_j}{\partial x_i} - \frac{2}{3}\frac{\partial \tilde{u}_k}{\partial x_k}\delta_{ij}\right)\right) + \overline{\rho} g_i \tag{1.2}$$

Note on Equation and Symbol fonts

The type of fonts used in Math equations and symbols is a dividing issue among researchers. Some prefer to use curvy font of Times (like I have used *AMS* fonts with the main *Times* font package) or an altogether different font (like *Computer Modern* which is default for LaTeX). Another way would be to strictly use Times font with few modifications (using `mathptmx` or `newtxmath` packages).

It a matter of personal preference to choose either of these options, and you can use it after discussing with your advisor and/or committee. All these packages and options are commented in the `01_packages.tex` file from the `0_settings` folder.

1.4 BIBLIOGRAPHY WITH BIBTEX

I strongly recommend that you use BIBTEX to generate your bibliography automatically. It makes managing your references much more effortless. It is an excellent way to organize your references and reuse them. You can use one set of entries for your references and cite them in your thesis, papers, and reports. If you have not used it anytime before, please invest some time learning how to use it. Also, you can use reference managers like Mendeley, Zotero, EndNote, etc., to import this bib-formatted library with all your references. It makes the citation process less painful. The `refs.bib` file used in this template is one such example.

I have included a simple example BIBTEX file along in this directory called `refs.bib`. The `iitmdiss.cls` class package used in this thesis and for the synopsis adopts the `natbib` package to format the references with a customized bibliography style. It is provided as the `iitm.bst` file in the directory containing `thesis.tex`. Documentation for the `natbib` package should be available in your distribution of LATEX. To cite the author along with the author name and year, use `\cite{key}` where `key` is the citation key for your bibliography entry. You can also use `\citet{key}` to get the same effect. To make the citation without the author name in the main text but inside the parenthesis, use `\citep{key}`. The following paragraph shows how citations can be used in text effectively.

More information on BIBTEX is available in the book by Lamport (1986*a*), which is a citation for the book. Lamport (1986*b*) is the same book citation in the old format where the year comes at the end. Now to cite the references within parentheses. There are many references (Lamport, 1986*a*) that explain how to use BIBTEX. Read the `natbib` package documentation for more details on how to cite things differently.

1.4.1 Sample Citations

Here are other references, for example. The present study has been carried out in OpenFOAM, which is based on Weller *et al.* (1998). The Lagrangian solver has two injection models based on the nature of the injection source, viz. `pointInjection` model, which injects the spray at a given point, and `detailedSprayProfileInjection` model, which injects the spray over a spherical sector of a given injection radius. The configuration and experimental data to compare the spray statistics is taken from Zhou (2015)

The above paragraphs had journal and book references. Other sample references to check are: for thesis Syed (2013); Cheekati (2014); Syed (2020), for conferences Sasidharan *et al.* (2017); Syed and Kumar (2018*b*,*a*), for manual Ayachit (2015), for book chapter Ahren *et al.* (2005).One more reference, Roenby *et al.* (2016) with arxiv and doi.

Python (van Rossum *et al.*, 1991–) is a programming language and is cited here to show how to cite something that is best identified with a URL. For the technical report, Syed (2015) is an example, and United Nations Security Council (2019) is an example of a non-technical report.

1.5 OTHER USEFUL LaTeX PACKAGES

The following packages might be helpful when writing your thesis. It is also an illustration of using pointers in your thesis where the text spacing within each pointer is single-spaced. There is a double spacing between two adjacent pointers.

- It is handy to include line numbers in your document. That way, it is straightforward for people to suggest corrections to your text. I recommend the usage of the `lineno` package for this purpose. It is not a standard package but can be obtained on the internet. The directory containing this file should contain a `lineno` directory that includes the package and documentation for it.
- The `listings` package should be available with your distribution of LaTeX. This package is handy when one needs to list source code or pseudo-code.
- For special figure captions the `ccaption` package may be useful. It is advantageous if one has a figure that spans more than two pages, and you need to use the same figure number.

- The notation page can be entered manually or automatically generated using the `nomencl` package.

More details on how to use these specific packages are available, along with the documentation of the respective packages.

CHAPTER 2

ANOTHER CHAPTER

More details on how to use these specific packages are available along with the documentation of the respective packages.

APPENDIX A

A SAMPLE APPENDIX

Just put in text as you would into any chapter with sections and whatnot. That's the end of it.

More details on how to use these specific packages are available along with the documentation of the respective packages.

APPENDIX B

ANOTHER SAMPLE APPENDIX

Another sample text

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2013 Bachelor of Technology (B. Tech.)

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Specialization : Aerospace Engineering

2015 Master of Science (M. S.)

Institution : Indian Institute of Technology Madras

Specialization : Aerospace Engineering

Doctor of Philosphy

Institution : Indian Institute of Technology Madras

Specialization : Aerospace Engineering

Registration Date : 15 July 2013

DOCTORAL COMMITTEE

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		Dr. C Sr. Lead Research Scientist FM Global Research, Norwood, MA, USA