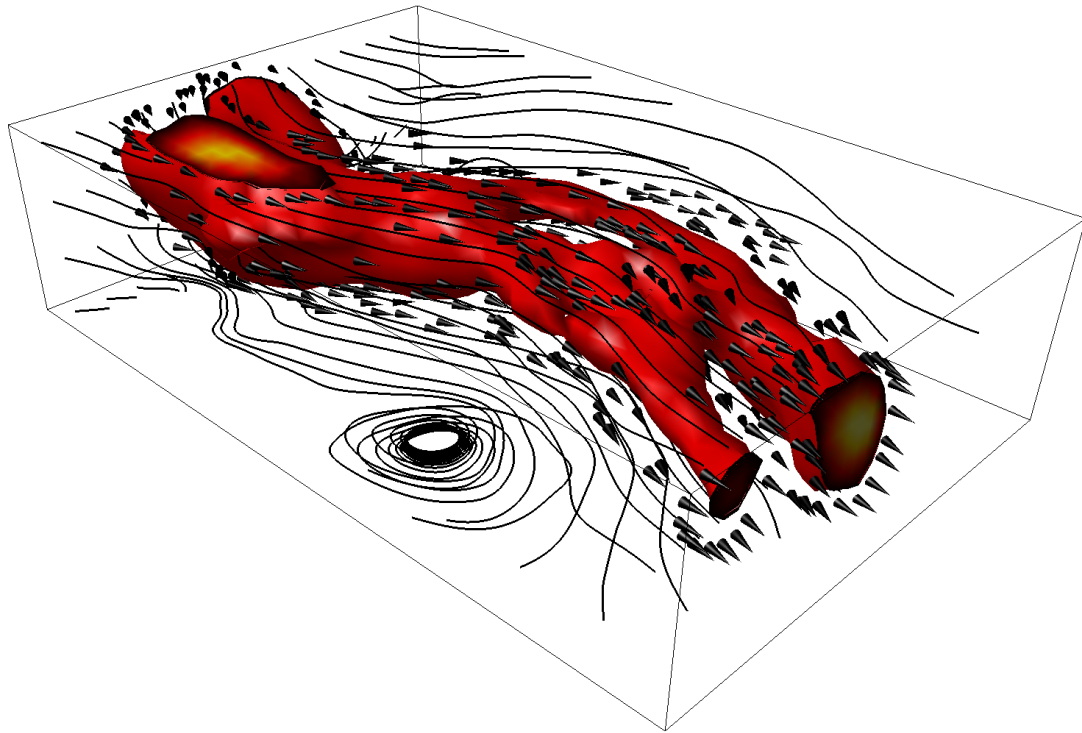




CHALMERS
UNIVERSITY OF TECHNOLOGY



A Chalmers University of Technology Degree project report template for L^AT_EX

A Subtitle that can be Very Much Longer if Necessary

Degree project report in Programme Name

NAME FAMILYNAME

DEPARTMENT OF SOME SUBJECT OR TECHNOLOGY

CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2023
www.chalmers.se

DEGREE PROJECT REPORT 2023

An Informative Headline describing the Content of the Report

A Subtitle that can be Very Much Longer if Necessary

NAME FAMILYNAME



CHALMERS
UNIVERSITY OF TECHNOLOGY

Department of Some Subject or Technology
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2023

An Informative Headline describing the Content of the Report
A Subtitle that can be Very Much Longer if Necessary
NAME FAMILYNAME

© NAME FAMILYNAME, 2023.

Supervisor: Name, Company or Department
Examiner: Name, Department

Degree project report 2023
Department of Some Subject or Technology
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone +46 31 772 1000

Cover: Wind visualization constructed in Matlab showing a surface of constant wind speed along with streamlines of the flow.

Typeset in L^AT_EX
Gothenburg, Sweden 2023

An Informative Headline describing the Content of the Report
A Subtitle that can be Very Much Longer if Necessary
NAME FAMILYNAME
Department of Some Subject or Technology
Chalmers University of Technology

Abstract

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Keywords: lorem, ipsum, dolor, sit, amet, consectetur, adipisicing, elit, sed, do.

Acknowledgements

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Name Familyname, Gothenburg, Month Year

List of Acronyms

Below is the list of acronyms that have been used throughout this thesis listed in alphabetical order:

BES	Battery Energy Storage
DER	Distributed Energy Resource
MILP	Mixed-Integer Linear Programming
MG	Microgrid
PV	Photovoltaic
RES	Renewable-based Energy Sources

Nomenclature

Below is the nomenclature of indices, sets, parameters, and variables that have been used throughout this thesis.

Indices

i,j	Indices for distribution network buses
t	Index for time step

Sets

$\mathcal{D}$	Set of distribution network buses
$\mathcal{D}_s$	Set of substation buses
$\mathcal{H}$	Set of time steps (simulation/scheduling horizon)
$\mathcal{N}$	Set of buses

Parameters

γ	Penalty coefficient
Δt	Time discretization step (time interval)
η_j^{ch}	Charging efficiency of BES
η_j^{dis}	Discharging efficiency of BES
$\mathbf{H}$	Adjacency matrix
N	Number of iterations
$P_{j,t}^L$	Active power of load demand
$P_{j,t}^{PV}$	Active power from solar generation

Variables

p_j	Active power injection at bus j
p_{ji}	Active power flow from bus j to bus i
v_i	Square of voltage magnitude at bus i

Contents

List of Acronyms	ix
Nomenclature	xi
List of Figures	xv
List of Tables	xvii
1 Introduction	1
1.1 Background	1
1.2 Purpose	1
1.3 Goals	1
1.4 Limitations / Demarcations	1
1.5 Section levels	1
1.6 Section	1
1.6.1 Subsection	1
1.6.1.1 Subsubsection	1
1.6.1.1.1 Paragraph	1
1.6.1.1.1.1 Subparagraph	1
2 Theory	3
2.1 Figure	3
2.2 Equation	3
2.3 Table	3
2.4 Chemical structure	4
2.5 List	4
2.6 Source code listing	4
2.7 To-do note	4
3 Methods	5
4 Results	7
5 Conclusion	9
Bibliography	11
A Appendix 1	I

List of Figures

2.1	Surface and contour plots showing the two dimensional function $z(x, y) = \sin(x + y) \cos(2x)$	3
-----	---	---

List of Tables

2.1	Values of $f(t)$ for $t = 0, 1, \dots, 5$	3
-----	---	---

1

Introduction

1.1 Background

1.2 Purpose

1.3 Goals

1.4 Limitations / Demarcations

This chapter presents the section levels that can be used in the template.

1.5 Section levels

The following table presents an overview of the section levels that are used in this document. The number of levels that are numbered and included in the table of contents is set in the settings file `Settings.tex`. The levels are shown in Section 1.6.

Name	Command
Chapter	<code>\chapter{<i>Chapter name</i>}</code>
Section	<code>\section{<i>Section name</i>}</code>
Subsection	<code>\subsection{<i>Subsection name</i>}</code>
Subsubsection	<code>\subsubsection{<i>Subsubsection name</i>}</code>
Paragraph	<code>\paragraph{<i>Paragraph name</i>}</code>
Subparagraph	<code>\subparagraph{<i>Subparagraph name</i>}</code>

1.6 Section

1.6.1 Subsection

1.6.1.1 Subsubsection

1.6.1.1.1 Paragraph

1.6.1.1.1.1 Subparagraph

2

Theory

In the following sections, examples of a figure, an equation, a table, a chemical structure, a list, a listing and a to-do note are shown.

2.1 Figure

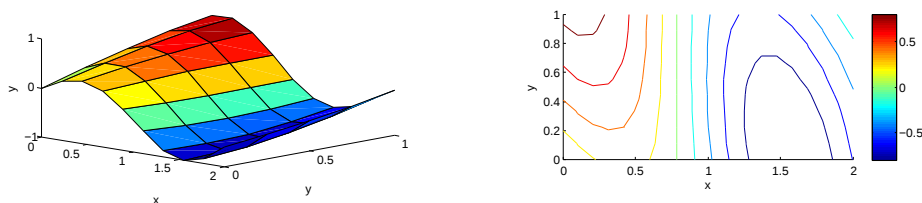


Figure 2.1: Surface and contour plots showing the two dimensional function $z(x, y) = \sin(x + y) \cos(2x)$.

2.2 Equation

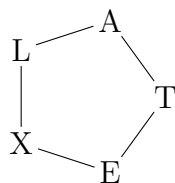
$$f(t) = \begin{cases} 1, & t < 1 \\ t^2 & t \geq 1 \end{cases} \quad (2.1)$$

2.3 Table

Table 2.1: Values of $f(t)$ for $t = 0, 1, \dots, 5$.

t	0	1	2	3	4	5
$f(t)$	1	1	4	9	16	25

2.4 Chemical structure



2.5 List

1. The first item
 - (a) Nested item 1
 - (b) Nested item 2
2. The second item
3. The third item
4. ...

2.6 Source code listing

```
% Generate x- and y-nodes
x=linspace(0,1); y=linspace(0,1);

% Calculate z=f(x,y)
for i=1:length(x)
    for j=1:length(y)
        z(i,j)=x(i)+2*y(j);
    end
end
end
```

2.7 To-do note

The `todo` package enables to-do notes to be added in the page margin. This can be a very convenient way of making notes in the document during the process of writing. All notes can be hidden by using the option *disable* when loading the package in the settings.

Example of a to-do note.

3

Methods

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

4

Results

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

5

Conclusion

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Bibliography

- [1] Gustaver, M. (2020) A Chalmers University of Technology Master's thesis template for L^AT_EX. Unpublished.

A

Appendix 1

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

DEPARTMENT OF SOME SUBJECT OR TECHNOLOGY
CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden
www.chalmers.se



CHALMERS
UNIVERSITY OF TECHNOLOGY