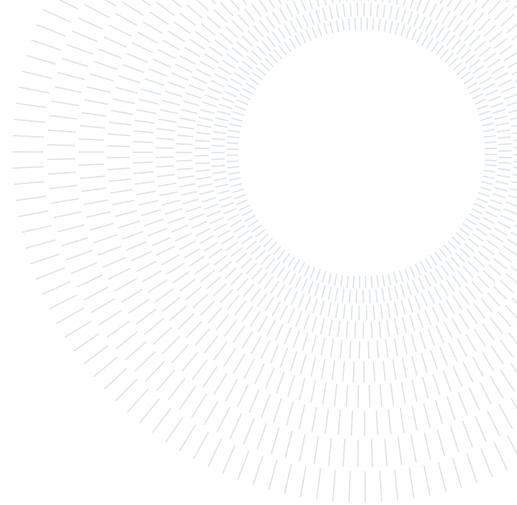




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**SCUOLA DI INGEGNERIA INDUSTRIALE
E DELL'INFORMAZIONE**



Title

NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS
MSc in HIGH PERFORMANCE COMPUTING ENGINEERING
ACADEMIC YEAR: 2025-2026

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Abstract: Lorem ipsum dolor sit amet consectetur adipiscing elit. Quisque fau-
cibus ex sapien vitae pellentesque sem placerat. In id cursus mi pretium tellus
duis convallis. Tempus leo eu aenean sed diam urna tempor. Pulvinar vivamus
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litora torquent per conubia nostra inceptos himenaeos.

Key-words: Numerical Analysis, Partial Differential Equations

1. Introduction

This document is intended to be both an example of the Polimi L^AT_EX template for Master Theses in article format, as well as a short introduction to its use. It is not intended to be a general introduction to L^AT_EX itself, and the reader is assumed to be familiar with the basics of creating and compiling L^AT_EX documents (see [2, 3]). The cover page of the thesis in article format must contain all the relevant information: title of the thesis, name of the Study Programme, name(s) of the author(s), student ID number, name of the supervisor, name(s) of the co-supervisor(s) (if any), academic year.

Be sure to select a title that is meaningful. It should contain important keywords to be identified by indexer. Keep the title as concise as possible and comprehensible even to people who are not experts in your field. The title has to be chosen at the end of your work so that it accurately captures the main subject of the manuscript. It is convenient to break the article format of your thesis (in article format) into sections and subsections. If necessary, subsubsections, paragraphs and subparagraphs can be used. A new section is created by the command

```
\section{Title of the section}
```

The numbering can be turned off by using `\section*{}`. A new subsection is created by the command

```
\subsection{Title of the subsection}
```

and, similarly, the numbering can be turned off by adding an asterisk as follows

```
\subsection*{}
```

It is recommended to give a label to each section by using the command

```
\label{sec:section_name}%
```

where the argument is just a text string that you'll use to reference that part as follows: *Section 1 contains INTRODUCTION*

2. Equations

This section gives some examples of writing mathematical equations in your thesis. Maxwell's equations read:

$$\left\{ \begin{array}{l} \nabla \cdot \mathbf{D} = \rho, \\ \nabla \times \mathbf{E} + \frac{\partial \mathbf{B}}{\partial t} = \mathbf{0}, \\ \nabla \cdot \mathbf{B} = 0, \\ \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \end{array} \right. \quad (1a)$$

$$\left\{ \begin{array}{l} \nabla \times \mathbf{E} + \frac{\partial \mathbf{B}}{\partial t} = \mathbf{0}, \\ \nabla \cdot \mathbf{B} = 0, \\ \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \end{array} \right. \quad (1b)$$

$$\left\{ \begin{array}{l} \nabla \cdot \mathbf{B} = 0, \\ \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \end{array} \right. \quad (1c)$$

$$\left\{ \begin{array}{l} \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \end{array} \right. \quad (1d)$$

Equation (1) is automatically labeled by `cleverref`, as well as Equation (1a) and Equation (1c). Thanks to the `cleverref` package, there is no need to use `\eqref`. Equations have to be numbered only if they are referenced in the text.

Equations (2), (3), (4), and (5) show again Maxwell's equations without brace:

$$\nabla \cdot \mathbf{D} = \rho, \quad (2)$$

$$\nabla \times \mathbf{E} + \frac{\partial \mathbf{B}}{\partial t} = \mathbf{0}, \quad (3)$$

$$\nabla \cdot \mathbf{B} = 0, \quad (4)$$

$$\nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \quad (5)$$

Equation (6) is the same as before, but with just one label:

$$\left\{ \begin{array}{l} \nabla \cdot \mathbf{D} = \rho, \\ \nabla \times \mathbf{E} + \frac{\partial \mathbf{B}}{\partial t} = \mathbf{0}, \\ \nabla \cdot \mathbf{B} = 0, \\ \nabla \times \mathbf{H} - \frac{\partial \mathbf{D}}{\partial t} = \mathbf{J}. \end{array} \right. \quad (6)$$

3. Figures, Tables and Algorithms

Figures, Tables and Algorithms have to contain a Caption that describes their content, and have to be properly referred in the text.

3.1. Figures

For including pictures in your text you can use `TikZ` for high-quality hand-made figures [1], or just include them with the command

```
\includegraphics[options]{filename.xxx}
```

Here xxx is the correct format, e.g. `.png`, `.jpg`, `.eps`,



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Figure 1: Caption of the Figure.

Thanks to the `\subfloat` command, a single figure, such as Figure 1, can contain multiple sub-figures with their own caption and label, e.g. Figure 2a and Figure 2b.



Figure 2: Caption of the Figure.

3.2. Tables

You can also consider to highlight selected columns or rows in order to make tables more readable. Moreover, with the use of `table*` and the option `bp` it is possible to align them at the bottom of the page. One example is presented in Table 1.

3.3. Algorithms

Pseudo-algorithms can be written in L^AT_EX with the `algorithm` and `algorithmic` packages. An example is shown in Algorithm 1.

Algorithm 1 Name of the Algorithm

```

1: Initial instructions
2: for for – condition do
3:   Some instructions
4: if if – condition then
5:   Some other instructions
6: end if
7: end for
8: while while – condition do
9:   Some further instructions
10: end while
11: Final instructions

```

4. Some further useful suggestions

Theorems have to be formatted as follows:

	column1	column2	column3	column4	column5	column6
row1	1	2	3	4	5	6
row2	a	b	c	d	e	f
row3	α	β	γ	δ	ϕ	ω
row4	alpha	beta	gamma	delta	phi	omega

Table 1: Highlighting the columns

Theorem 4.1. Write here your theorem.

Proof. If useful you can report here the proof.

Propositions have to be formatted as follows:

Proposition 4.1. Write here your proposition.

How to insert itemized lists:

- first item;
- second item.

How to write numbered lists:

1. first item;
2. second item.

5. Conclusions

A final section containing the main conclusions of your research/study and possible future developments of your work have to be inserted in the section “Conclusions”.

References

- [1] CTAN. pgf – create PostScript and PDF graphics in TEX.
- [2] Stefan Kottwitz. *LaTeX Cookbook*. Packt Publishing Ltd, 2015.
- [3] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl. The not so short introduction to latex2 ε . *Electronic document available at <http://www.tex.ac.uk/tex-archive/info/lshort>*, 1995.