HEC MONTRÉAL

Writing with \title{LaTeX}

The Basics

BENOIT HAMEL

Benoit Hamel
Library technician, technical support
HEC Montréal Library

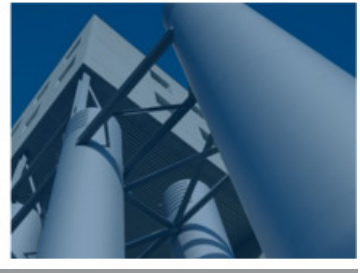
Writing with \title{LaTeX}

Part One : The Basics
HEC Montréal Edition, revised and extended (english version)

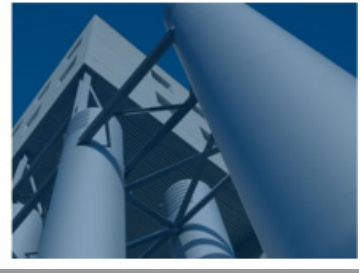
HEC MONTRÉAL

Training Session Summary

A TEX and LATEX Presentation



HEC MONTRÉAL



What is TEX and LATEX?

What is TEX?

DONALD KNUTH

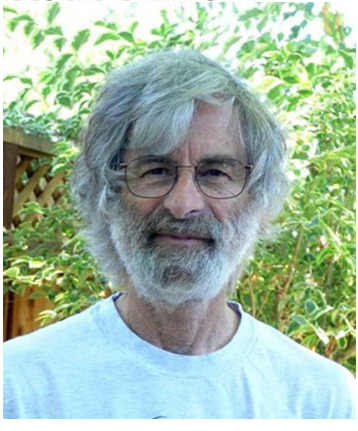
© Jacob Appelbaum, 2005

- A typesetting system created by Donald Knuth.
- "The most powerful formatting program for producing book-quality text of scientific and technical works."[a]
- A mature, stable, complete, bug-free system.
- A set of primitive commands perfect for typographic and programmatic functions.
- "*typesetter-level program*"

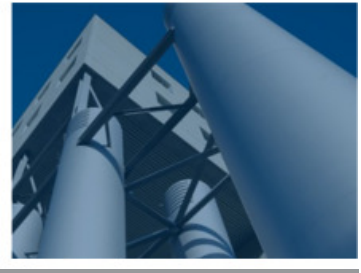
[a] Kopka & Daly, p. 6

What is LaTeX?

Leslie Lamport



- A set of markup commands created by Leslie Lamport to facilitate TeX's use.
- Doesn't require any knowledge of typography in general and TeX particularly.
- Typographic and logical markup language used to set the text layout (like HTML).
- Cross-platform language, identical from one operating system to the other and extensible with packages.
- "*author-level program*"



LaTeX Document Creation Process

HEC MONTRÉAL

Writing with a new perspective

- You write your document in plain text and you use commands to describe **what the text is** and **not what it should look like**.
- You focus on your **content**.
- You let LaTeX do its work, that is taking care of the **container**.

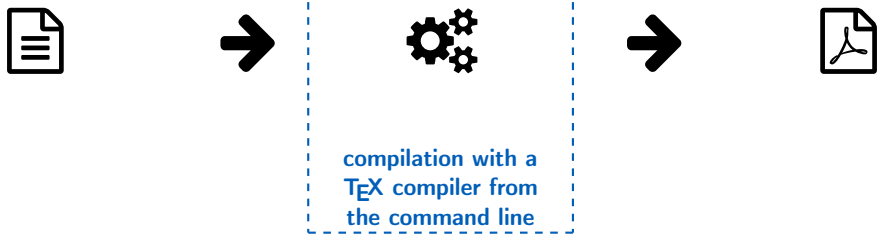
LaTeX Document Creation Process





LaTeX Document Creation Process

LaTeX Document Creation Process



LaTeX Document Creation Process




visualization with an external reader

Some Things Done Simply with LaTeX...

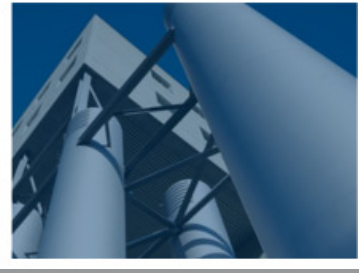
... and not necessarily with a word processor

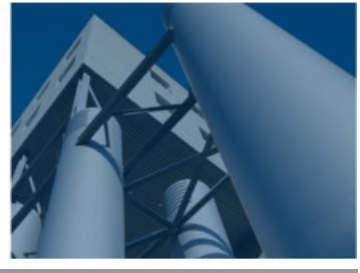
- Title page
- Table of contents
- Page numbering
- Figures and tables: display on a page, numbering, reference
- Equations: display, numbering and reference
- Citations and bibliographies
- Hyphenation
- Two-sided documents

Tools you'll need

- A TEX distribution
  - TEX Live (Windows and Unix/Linux)
  - MacTEX, derived from TEX Live (Mac OS)
  - MiKTEX (Windows, Mac OS and Unix/Linux)
- An integrated writing environment
  - Too many to list them all...
  - The library uses and recommends TEXStudio
- A command line terminal

The Basics





Document Structure

Document structure

A LaTeX document always has two parts:

```
\documentclass[11pt,french]{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage{babel}
\usepackage[autolanguage]{numprint}

\begin{document}

  \section{Primo}

  Ac class dis donec erat facilisis magna mattis
  placerat potenti praesent primis sed tellus turpis
  ut vehicula. Ad amet eleifend eros fames habitant
  imperdiet integer laoreet leo magna magnis neque
  netus senectus taciti torquent.

  \section{Deuxio}

  Cursus dui egestas eget eros et hac magna massa mollis
  natoque penatibus sagittis sed tellus urna velit
  vestibulum vitae vulputate.
\end{document}
```

Document structure

A LaTeX document always has two parts:

```
\documentclass[11pt,french]{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage{babel}
\usepackage[autolanguage]{numprint}
```

← Preamble

```
\begin{document}

  \section{Primo}

  Ac class dis donec erat facilisis magna mattis
  placerat potenti praesent primis sed tellus turpis
  ut vehicula. Ad amet eleifend eros fames habitant
  imperdiet integer laoreet leo magna magnis neque
  netus senectus taciti torquent.

  \section{Deuxio}

  Cursus dui egestas eget eros et hac magna massa mollis
  natoque penatibus sagittis sed tellus urna velit
  vestibulum vitae vulputate.
\end{document}
```

HEC MONTRÉAL

Document structure

A LaTeX document always has two parts:

```
\documentclass[11pt,french]{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage{babel}
\usepackage[autolanguage]{numprint}
```

```
\begin{document}

  \section{Primo}

  Ac class dis donec erat facilisis magna mattis
  placerat potenti praesent primis sed tellus turpis
  ut vehicula. Ad amet eleifend eros fames habitant
  imperdiet integer laoreet leo magna magnis neque
  netus senectus taciti torquent.

  \section{Deuxio}

  Cursus dui egestas eget eros et hac magna massa mollis
  natoque penatibus sagittis sed tellus urna velit
  vestibulum vitae vulputate.
\end{document}
```

← Document body

Preamble

Document Class

The preamble's **first command** usually is the document class declaration.

```
\documentclass[options]{class}
```

Preamble
Document Class

The preamble's **first command** usually is the document class declaration.

```
\documentclass[options]{class}
```

Main classes

- article, book, letter, report
- memoir, **hecthese**
- slides, beamer, **hecppt**

Preamble
Document Class

The preamble's **first command** usually is the document class declaration.

```
\documentclass[options]{class}
```

Main classes

- article, book, letter, report
- memoir, **hecthese**
- slides, beamer, **hecppt**

Main options

- 10pt, 11pt, 12pt
- oneside, twoside
- openright, openany
- english, french

HEC MONTRÉAL

Preamble

Packages

Packages allow you to **modify existing commands** and to **add features** to the system.

They are loaded in the preamble with the `\usepackage[options]{package}` command.

```
\documentclass[options]{class}

\usepackage{package}
\usepackage[options]{package}
\usepackage{package1,package2,package3,...}
```

Each package's documentation can be found on the Comprehensive TEX Archive Network Website.

Commands

- Always begin with a \
- Three main forms:

```
\commandname[optional_args]{mandatory_args}
\commandname*[optional_args]{mandatory_args}
\commandname
```

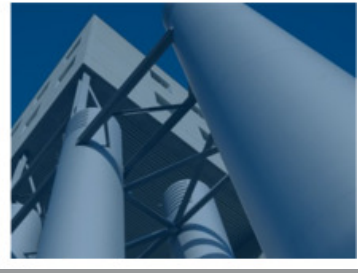
- Mandatory arguments between { and }
- Optional arguments between [and]
- Commands without arguments: the command's name ends with any character that isn't a letter or with a blank space.
- A command's scope is limited between { and }.

Environments

- Delimited by

```
\begin{environment}
  ...
\end{environment}
```

- An environment's content is treated differently from the remainder of the text.
- Changes apply only to the environment's content.



Writing

Writing

- You write your text in the `document` environment:

```
\begin{document}
  The content of your document goes here...
\end{document}
```

- You write your document in plain text and use commands and environments to structure your text;
- You write your text like anywhere else:
  - Words are separated by one or more blank spaces;
  - Paragraphs are separated by one or more empty lines;
  - All extra white space is deleted on compilation.

Reserved Characters

TEX's Reserved Characters

- `#` Argument number in commands
- `$` Math Mode delimiter
- `&` Table column delimiter
- `%` Starts a comment
- `_` Indices (math)
- `^` Exponents (math)
- `~` No-break space
- `{` Opens a command or an environment definition
- `}` Closes a command or an environment definition

Reserved Characters

TEX's Reserved Characters

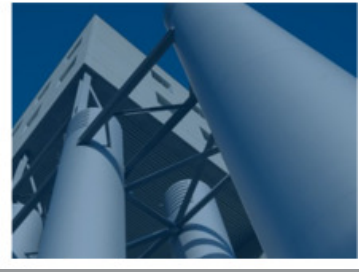
		TO USE THE CHARACTERS:
#	Argument number in commands	\#
$	Math Mode delimiter	\$
&	Table column delimiter	\&
%	Starts a comment	\%
_	Indices (math)	_
^	Exponents (math)	\textasciicircum
~	No-break space	\textasciitilde
{	Opens a command or an environment definition	\{
}	Closes a command or an environment definition	\}

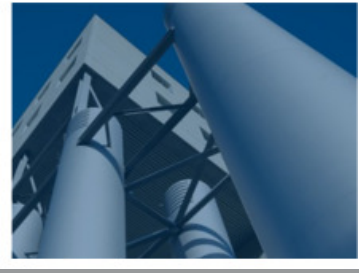
HEC MONTRÉAL

Reserved Characters

- Quotation marks
  - The quotation marks " found on a keyboard are not used in typesetting.
  - Single (`) or double (``) beginning marks and single (') or double ('') end marks are used to surround quotes.
- We type hyphens once (-), twice (--) or three times (---) to produce hyphens, *en dash*es and *em dash*es.

Document Organization





Parts of a Document

Class Choice

The first thing you need to do when writing a LaTeX document is to choose a document class.

Class	Divisions	Organization	Header	Footer
`article`	parts, sections, ...	one-sided	empty	centered page number
`report`	parts, chapters, sections, ...	one-sided	empty	centered page number
`book`	parts, chapiters, sections, ...	two-sided	page numbers, titles	empty
`hecthese`	chapiters, sections, subsections	two-sided	empty	centered page number

Titles and Title Page

Automatic layout:

```
% Preamble commands
\title[short title]{long title}
\author[short author name]{long author name}
\date[short date]{long date}
[...]

% Document body command
\maketitle
```

Manual layout:

STANDARD CLASSES

```
\begin{titlepage}
  ...
\end{titlepage}
```

MEMOIR AND HECTHESE CLASSES

```
\begin{titlingpage}
  ...
\end{titlingpage}
```

In the **hecthese** document class, title pages are automatically generated.

Abstract

- **article**, **report** or **memoir** classes : abstract generated with the abstract environment

```
\begin{abstract}
  ...
\end{abstract}
```

- **hecthese** class: french and english abstracts treated as normal, unnumbered chapters

Sections

- The document is subdivided with the following commands:

```
\part[short title]{long title}
\chapter[short title]{long title}
\section[short title]{long title}
\subsection[short title]{long title}

\subsubsection[short title]{long title}   % avoid using in books

\paragraph[short title]{long title}     % evil! never use!
\subparagraph[short title]{long title}  % EVIL! never EVER use!
```

- Automatic numbering
- Commands followed by an * = unnumbered section
- Short title as an optional argument

Appendices

- Appendices are sections and chapters with an alphanumeric numbering (A, A.1, ...).
- Sections following the `\appendix` command are all considered appendices.
- In the title, "Chapter" is changed into "Appendix".

A Book's Logical Structure

book, memoir, hecthese classes

`\frontmatter`

- preface, table of contents, etc.
- roman page numbering (i, ii, ...)
- unnumbered chapters

`\mainmatter`

- the book's content
- arabic page numbering, starting at 1
- numbered chapters

A Book's Logical Structure

book, memoir, hecthese classes

```
\backmatter
```

- everything else (bibliography, index, etc.)
- the page numbering continues
- unnumbered chapters

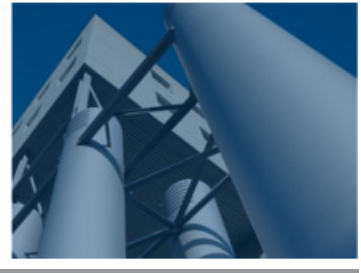


Table of Contents and Referencing

HEC MONTRÉAL

Table of Contents

- The table of contents is automatically generated with `\tableofcontents` .
- Needs **more than one** compilation to be generated.
- Unnumbered sections are not included.
- With the **hyperref** package, `\tableofcontents` generates the .pdf file's table of contents.

Table of Contents

- The table of contents is automatically generated with `\tableofcontents` .
- Needs **more than one** compilation to be generated.
- Unnumbered sections are not included.
- With the **hyperref** package, `\tableofcontents` generates the .pdf file's table of contents.
- `\tableofcontents*` , from the memoir document class, doesn't include the table of contents in the table of contents.

Table of Contents

- The table of contents is automatically generated with `\tableofcontents` .
- Needs **more than one** compilation to be generated.
- Unnumbered sections are not included.
- With the **hyperref** package, `\tableofcontents` generates the .pdf file's table of contents.
- `\tableofcontents*` , from the memoir document class, doesn't include the table of contents in the table of contents.
- `\listoffigures` generates the list of figures.
- `\listoftables` generates the list of tables.

Labels and Automatic Referencing

Because your computer will do it better than you...

- **Never** refer manually to a section, an equation, a table, etc.
- "Name" an element with `\label`
- Refer to that label with `\ref`
- Needs 2 to 3 compilations to generate

```
\section{Definitions}
  \label{sec:definitions}

  Lorem ipsum dolor sit amet, consectetur adipiscing 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.

\section{History}
  As seen in Section \ref{sec:definitions}...
```

HEC MONTRÉAL

Labels and Automatic Referencing

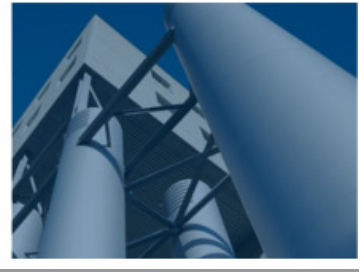
Because your computer will do it better than you...

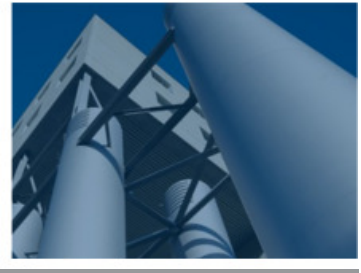
- The **hyperref** package generates hyperlinks to the references in the .pdf files.
- The `\autoref{}` command...
  1. automatically identifies the reference type (section, equation, table, etc.);
  2. generates a hyperlink with the text **and** number of the reference.

```
As seen in \autoref{sec:definitions}...
```

- The `\pageref{}` command refers to a page number.
- The **amsmath** package provides the `\eqref{}` command to refer to equations.

Text Appearance





Fonts

Fonts

- By default, all LaTeX documents use the same font, Computer Modern.
- You should choose high-quality and complete fonts (diacritics, great choice of symbols).
- Very few fonts are adapted to maths: Palatino, Times, Lucida (\$) are safe choices.
- In the **hecthese** document class, mathptmx and mathpazo packages are preloaded so you can choose between Times and Palatino fonts.

Font Attributes

families		
roman	`\rmfamily`	`\textrm{<text>}`
`fixed width`	`\ttfamily`	`\texttt{<text>}`
sans serif	`\sffamily`	`\textsf{<text>}`
shapes		
upright	`\upshape`	`\textup{<text>}`
italic	`\itshape`	`\textit{<text>}`
slanted	`\slshape`	`\textsl{<text>}`
SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

Font Attributes

families		
roman	`\rmfamily`	`\textrm{<text>}`
`fixed width`	`\ttfamily`	`\texttt{<text>}`
sans serif	`\sffamily`	`\textsf{<text>}`
shapes		
upright	`\upshape`	`\textup{<text>}`
italic	`\itshape`	`\textit{<text>}`
slanted	`\slshape`	`\textsl{<text>}`
SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

applies to all the following text

Font Attributes

families		
roman	`\rmfamily`	`\textrm{<text>}`
`fixed width`	`\ttfamily`	`\texttt{<text>}`
sans serif	`\sffamily`	`\textsf{<text>}`
shapes		
upright	`\upshape`	`\textup{<text>}`
italic	`\itshape`	`\textit{<text>}`
slanted	`\slshape`	`\textsl{<text>}`
SMALL CAPS	`\scshape`	`\textsc{<text>}`
series		
medium	`\mdseries`	`\textmd{<text>}`
bold	`\bfseries`	`\textbf{<text>}`

applies to the text in the command

HEC MONTRÉAL

Italics

When using italics to put *emphasis* on parts of a text, you should use the following semantic command instead:

```
\emph{text}
```

`\emph{<text>}` commands can be nested in one another. Text in italics becomes upright and vice versa.

```
This house lacks a certain
\emph{je ne sais quoi}\ldots
```

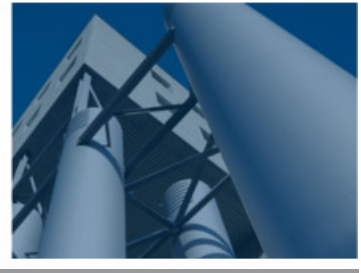
This house lacks a certain *je ne sais quoi*...

```
He said: “ \emph{Enough
\emph{poutine} for the week!"}
```

He said: « *Enough* poutine *for the week!*»

Font size

Standard commands	Size
\tiny	tiny
\scriptsize	script size
\footnotesize	footnote size
\small	small
\normalsize	normal size
\large	large
\Large	larger
\LARGE	largest
\huge	huge
\Huge	humongous



Displaying text

Lists

- Two main types of lists:
  1. **unordered** with the `\itemize` environment
  2. **ordered** with the `\enumerate` environment
- Lists can be nested into one another
- Markers are adapted to up to four nesting levels

Lists

- Two main types of lists:
  1. **unordered** with the `\itemize` environment
  2. **ordered** with the `\enumerate` environment
- Lists can be nested into one another
- Markers are adapted to up to four nesting levels

```
\begin{itemize}
  \item Two main types of lists:
  \begin{enumerate}
    \item \textbf{unordered} with the \verb=itemize= environment
    \item \textbf{ordered} with the \verb=enumerate= environment
  \end{enumerate}
  \item Lists can be nested into one another
  \item Markers are adapted to up to four nesting levels
\end{itemize}
```

Lists

- Two main types of lists:
  1. **unordered** with the `\itemize` environment
  2. **ordered** with the `\enumerate` environment
- Lists can be nested into one another
- Markers are adapted to up to four nesting levels

```
\begin{itemize}
  \item Two main types of lists:
  \begin{enumerate}
    \item \textbf{unordered} with the \verb=itemize= environment
    \item \textbf{ordered} with the \verb=enumerate= environment
  \end{enumerate}
  \item Lists can be nested into one another
  \item Markers are adapted to up to four nesting levels
\end{itemize}
```

- A third list type is available: `description`

Quotations

Short Quotes

We use the `quote` environment to insert a short, one-paragraph quote in our text.

```
\begin{quote}
  Life is what happens to you while
  you're busy making other plans.
  -- John Lennon
\end{quote}
```

Life is what happens to you while you're busy making other plans. – John Lennon

Quotations

Long Quotations

We use the `quotation` environment to insert long quotations.

```
\begin{quotation}
  I've missed more than 9000 shots in my
  career. I've lost almost 300 games. 26
  times I've been trusted to take the game
  winning shot and missed.

  I've failed over and over and over again
  in my life. And that is why I succeed.
  -- Michael Jordan
\end{quotation}
```

> *I've missed more than 9000 shots in my career. I've lost almost 300 games. 26 times I've been trusted to take the game winning shot and missed.*
>
> *I've failed over and over and over again in my life. And that is why I succeed. – Michael Jordan*

Footnotes

- A footnote is inserted with the following command:

```
\footnote{text}
```

- The command must immediately follow the annotated text.
- Recommended method:

```
... fera remarquer que Pierre Lasou\footnote{%
Spécialiste en ressources documentaires} %
fut une grande aide dans la préparation de ...
```

- Footnote numbering and display are automatically generated.

Source Code

- To write source code in our text, we use the `verbatim` environment.

```
\begin{verbatim}
  Text displayed as is in a
  fixed-width font.
\end{verbatim}
```

- To write source code inline in our text, we use the `\verb` command. Its syntax is `\verbcsourcec` where *c* can be any character not found in *source*.
- For more thorough inclusions of source code, you should use the **listings** package.

[1] taken from the r4stats.com Website.

Source Code

Example[1] :

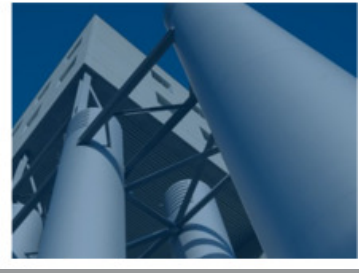
```
# ---Writing Your Own Functions (Macros)---

# A good function that just prints.
mystats <- function(x) {
  print( mean(x, na.rm = TRUE) )
  print(   sd(x, na.rm = TRUE) )
}
mystats(myvar)

# A function with vector output.
mystats  <- function(x) {
  mymean <- mean(x, na.rm = TRUE)
  mysd   <-   sd(x, na.rm = TRUE)
  c(mean = mymean, sd = mysd )
}
mystats(myvar)
myVector <- mystats(myvar)
myVector
```

[1] taken from the r4stats.com Website.

hecthese Document Class



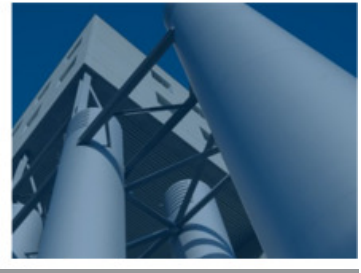
HEC MONTRÉAL

hecthese Document Class

- Document class made specifically for HEC Montréal's M.Sc. and Ph.D. students;
- Available at https://ctan.org/pkg/hecthese;
- Document layout fully complies to the Guidelines for Writing an Academic Work at a Graduate Level;
- Based on the **memoir** document class;
- Homemade commands for title creation and more. . . ;
- New homemade environments;
- You choose a template as a starting point (templates are available once the document class has been installed in a working directory);
- You use separate files for each chapter in your document.

HEC MONTRÉAL

Bibliographie



HEC MONTRÉAL

Bibliographie

Pour les nostalgiques de l'odeur de l'encre


Kopka, Helmut et Patrick W. Daly (2004).
Guide to LaTeX, Fourth Edition,
Addison-Wesley,
ISBN 978-0-321-17385-0, 597 p.


Mittelbach, Frank *et al.* (2004).
The LaTeX Companion, Second Edition,
Addison-Wesley,
ISBN 978-0201362992, 1120p.


Goossens, Michel et Franck Mittelbach (2007).
The LaTeX Graphics Companion, Second Edition,
Addison-Wesley,
ISBN 978-0321508928, 976p.

Bibliographie

Pour les consciencieux de la forêt boréale

Goulet, Vincent (2016).
formation-latex-ul – Introductory LaTeX course in French,
Comprehensive TeX Archive Network,
Consulté le 22 février 2018 à https://ctan.org/pkg/formation-latex-ul

Lees-Miller, John D. (2018).
Free & Interactive Online Introduction to LaTeX,
Overleaf,
Consulté le 22 février 2018 à https://www.overleaf.com/latex/learn/free-online-introduction-to-latex-part-1

ShareLaTeX Documentation,
ShareLaTeX,
Consulté le 22 février à https://fr.sharelatex.com/learn/Main_Page

Bibliographie

Pour les consciencieux de la forêt boréale

- LaTeX WikiBook
- ShareLaTeX Documentation
- TeX - LaTeX Stack Exchange
- LaTeX Community
- Comprehensive TeX Archive Network
- UK List of TEX Frequently Asked Questions
- Google. . .

Période de questions

Documentation de la formation

http://bit.ly/ltxhec1

Évaluation de la formation

http://bit.ly/ltxsurvey1

Support TEXnique

Benoit Hamel : <benoit.2.hamel@hec.ca>