



UNIVERSIDAD
DE GRANADA

Procesamiento de Señales Biomédicas

Grado en Ingeniería Electrónica Industrial

Taller 1. LaTeX



Joaquín T. Valderrama

*Departamento de Teoría de la Señal, Telemática y Comunicaciones
Escuela Técnica Superior de Ingeniería Informática y de Telecomunicación
Universidad de Granada*

jvalderrama@ugr.es

Qué es LaTeX

The image displays two windows from the TeXworks application. The left window shows the source LaTeX code for a document titled 'Document.tex'. The code includes package declarations, title and author information, and content sections for an abstract, a figure, and a table. The right window shows the rendered PDF output, 'Document.pdf', which displays the formatted document. The PDF includes a title page with the title 'My first L^AT_EX template', author information for Mickey Mouse and Donald Duck, a date of July 7, 2017, and a table of contents. The main body of the PDF contains an abstract, a section on '1 Figures & tables' with a sub-section '1.1 How to place a figure' that includes a cartoon image of Donald Duck, and a section on '2 How to use a list'.

```
% DOCUMENT CLASS
\documentclass[11pt,english]{article}

% PACKAGES
\usepackage[utf8]{inputenc} % ojo a la codificación: UTF8 (utf0 en preferencias de texworks) o Latin 1 (ISO-8859-1)
\usepackage{amsmath,amssymb,amsfonts}
\usepackage{natbib}
\usepackage{pdftex}
\usepackage{graphicx}
\usepackage{epstopdf}
\usepackage{url}
\usepackage{textcomp}
\usepackage{enumerate}
\usepackage{m}[fullpage]
\setlength{\parskip}{0.5ex}

% TITLE
\title{My first LATEX template}

% AUTHORS
\author{Mickey Mouse1, Donald Duck1,21Department of Linguistics, Macquarie University, Sydney, Australia} \\ \emph{2Parliament House, Canberra, Australia}

% DOCUMENT
\begin{document}

% Create the title and the table of contents
\maketitle

% Abstract
\begin{abstract}
Summary of the document.
\end{abstract}

% Section that shows how to place a figure and a table using two subsections
\section{Figures & tables}

This section shows how to place a \textbf{figure} and a \emph{table} in two different subsections. Note how to use \emph{italics} and \textbf{bold}, and that I use a clearpage command to go to the next page.

\subsection{How to place a figure}

Figure~\ref{Fig1} shows...

\begin{figure}[t]
\begin{center}
\includegraphics[width=2.5cm]{Figures/DonaldDuck}
\caption{Caption of this figure.}
\label{Fig1}
\end{center}
\end{figure}

\clearpage

\subsection{How to place a table}

Table~\ref{Tbl1} shows...

\begin{table}[ht]
\begin{center}
\begin{tabular}{|r||}
\hline
\hline
7CD & hexadecimal \\
3700 & octal \\
\cline{2-2}
11111000000 & binary \\
\hline
1984 & decimal \\
\hline
\end{tabular}
\end{center}
\end{table}

\end{document}
```

My first L^AT_EX template

Mickey Mouse¹, Donald Duck^{1,2}

¹Department of Linguistics, Macquarie University, Sydney, Australia
²Parliament House, Canberra, Australia

July 7, 2017

Contents

1	Figures & tables	1
1.1	How to place a figure	1
1.2	How to place a table	2
2	How to use a list	2
3	How to place some maths equations	2
A	Recommended lecture	2

Abstract

Summary of the document.

1 Figures & tables

This section shows how to place a **figure** and a *table* in two different subsections. Note how to use *italics* and **bold**, and that I use a `clearpage` command to go to the next page.

1.1 How to place a figure

Figure 1 shows...

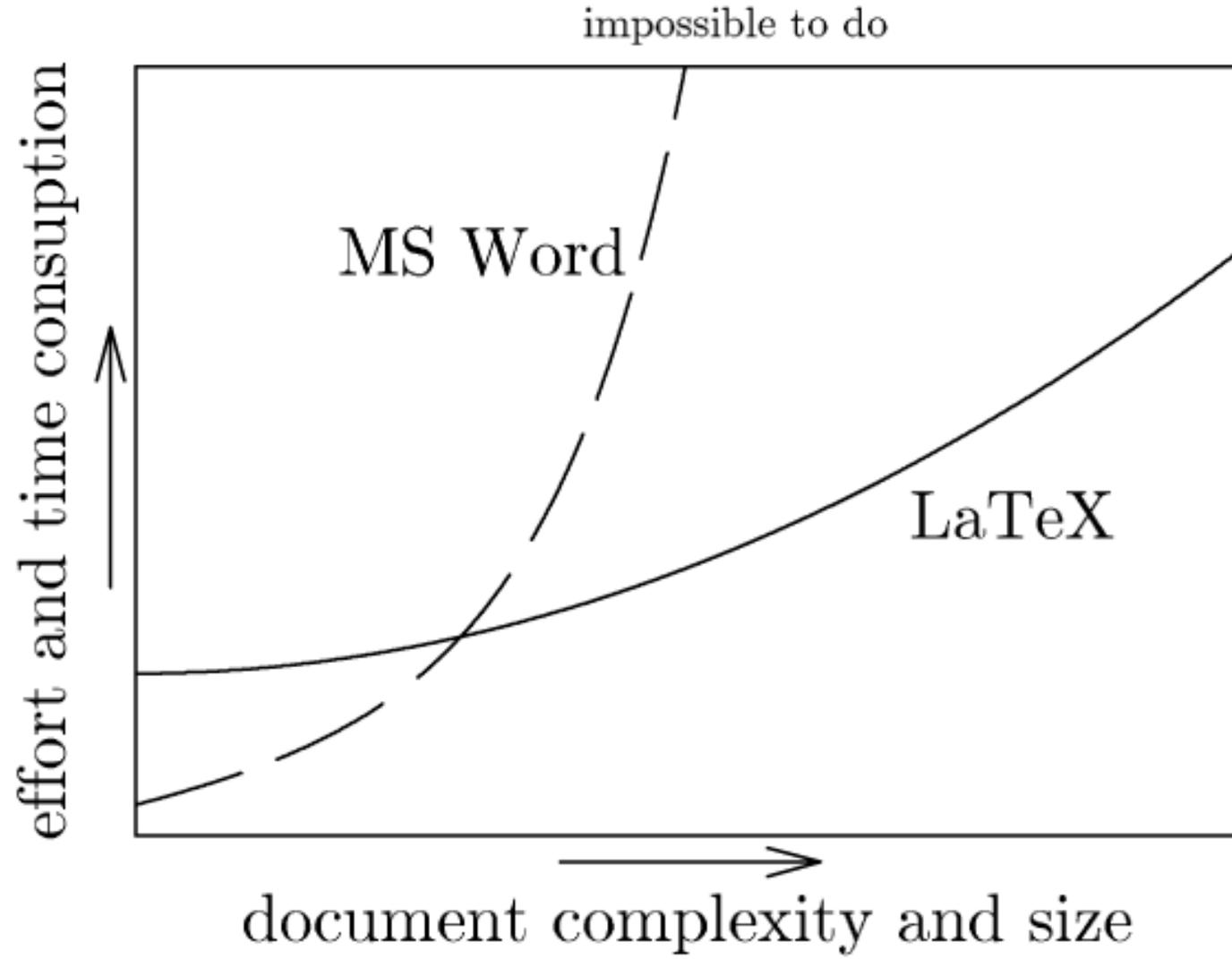


Figure 1: Caption of this figure.

1

¿Por qué necesito LaTeX?

- Te centras en el contenido, no en el formato.
- Las fuentes son bonitas y profesionales.
- Gestiona de manera muy eficiente referencias, índices, listas de figuras...
- La visualización de ecuaciones matemáticas es prácticamente perfecta.
- La licencia es gratuita.
- Fácil de aprender, con multitud de foros y ejemplos que ayudan a resolver dificultades técnicas.
- LaTeX es especialmente apropiado en documentos complejos



¿Qué vamos a aprender hoy?

- Estudiaremos algo de **Teoría**
 - ✓ Primeros pasos, elementos principales y filosofía de LaTeX
 - ✓ Cómo insertar una figura
 - ✓ Cómo crear tablas
 - ✓ Cómo crear una lista
 - ✓ Cómo enfatizar texto: *itálica*, **negrita**, subrayado
 - ✓ Cómo insertar ecuaciones matemáticas
 - ✓ Cómo referenciar figuras, tablas, secciones y fuentes bibliográficas
- Y afianzaremos lo aprendido con algo de **Práctica**
 - ✓ Instalación de MiKTeX
 - ✓ Tu primer documento en LaTeX

Estructura de un documento LaTeX

```
\documentclass{...}  
\usepackage{...}  
\begin{document}  
\end{document}
```

- Ejemplo de un documento muy simple

```
\documentclass{article}  
\begin{document}  
Small is beautiful.  
\end{document}
```

`\documentclass[options]{class}`

Document Classes.

`article` for articles in scientific journals, presentations, short reports, program documentation, invitations, ...

`proc` a class for proceedings based on the article class.

`minimal` is as small as it can get. It only sets a page size and a base font. It is mainly used for debugging purposes.

`report` for longer reports containing several chapters, small books, PhD theses, ...

`book` for real books

`slides` for slides. The class uses big sans serif letters. You might want to consider using the Beamer class instead.

Document Class Options.

`10pt`, `11pt`, `12pt` Sets the size of the main font in the document. If no option is specified, `10pt` is assumed.

`a4paper`, `letterpaper`, ... Defines the paper size. The default size is `letterpaper`. Besides that, `a5paper`, `b5paper`, `executivepaper`, and `legalpaper` can be specified.

`onecolumn`, `twocolumn` Instructs `LATEX` to typeset the document in one column or two columns.

`twoside`, `oneside` Specifies whether double or single sided output should be generated. The classes `article` and `report` are single sided and the `book` class is double sided by default. Note that this option concerns the style of the document only. The option `twoside` does *not* tell the printer you use that it should actually make a two-sided printout.

`\usepackage[options]{package}`

```
\usepackage[spanish,es-tabla]{babel}
```

```
\usepackage{amsmath,amsfonts,amssymb}
```

```
\usepackage{natbib}
```

```
\usepackage{graphicx}
```

```
\usepackage[cm]{fullpage}
```

```
\usepackage[numbered,framed]{mcode}
```

```
\usepackage[colorlinks=true,allcolors=blue]{hyperref}
```

Dos preguntas importantes

- ¿Qué paquetes debo incluir?
- ¿Cómo instalo los paquetes?

Espacios

- Varios espacios consecutivos se ignoran.
- Los espacios al comienzo de una línea se ignoran.
- Una línea vacía define el final de un párrafo.

```
It does not matter whether you
enter one or several      spaces
after a word.
```

```
An| empty line starts a new
paragraph.
```

```
It does not matter whether you enter one
or several spaces after a word.
```

```
An empty line starts a new paragraph.
```

- ~ inserta un espacio duro (no separable) → Alt+126

```
Mr.~Smith was happy to see her\\
cf.~Fig.~5\\
```

```
Mr. Smith was happy to see her
cf. Fig. 5
```

Secciones, subsecciones, párrafos y capítulos

```
\section{...}  
\subsection{...}  
\subsubsection{...}  
\paragraph{...}  
\subparagraph{...}
```

```
\chapter{...}
```

```
\tableofcontents
```

Título

```
\title{...}, \author{...} and optionally \date{...}
```

```
\maketitle
```

Referencias cruzadas

```
\label{marker}, \ref{marker} and \pageref{marker}
```

A reference to this subsection
`\label{sec:this}` looks like:
“see section~`\ref{sec:this}` on
page~`\pageref{sec:this}`.”

A reference to this subsection looks like:
“see section 2.8 on page 41.”

Pies de página

```
\footnote{footnote text}
```

Footnotes `\footnote{This is
a footnote.}` are often used
by people using `\LaTeX`.

Footnotes^a are often used by people using
`LaTeX`.

^aThis is a footnote.

Enfatizar texto

`\underline{word}`

word

`\emph{word}`

word

`\textbf{word}`

word

`\textcolor[red]{word}`

word

Entornos

```
\begin{environment} text \end{environment}
```

```
\begin{aaa}... \begin{bbb}... \end{bbb}... \end{aaa}
```

Los entornos más importantes son:

- document
- abstract
- itemize, enumerate and description
- figure
- tabular
- equation
- thebibliography

Abstract

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

The abstract abstract.

itemize, enumerate, description

```
\begin{enumerate}
\item You can nest the list
environments to your taste:
\begin{itemize}
\item But it might start to
look silly.
\item[-] With a dash.
\end{itemize}
\item Therefore remember:
\begin{description}
\item[Stupid] things will not
become smart because they are
in a list.
\item[Smart] things, though,
can be presented beautifully
in a list.
\end{description}
\end{enumerate}
```

1. You can nest the list environments to your taste:
 - But it might start to look silly.
 - With a dash.
2. Therefore remember:
Stupid things will not become smart because they are in a list.
Smart things, though, can be presented beautifully in a list.

Figures

La figura~\ref{Fig1} muestra...

```
\begin{figure}[!htbp]
\begin{center}
\includegraphics[width=2.5cm]{Figuras/Figura3D}
\caption{Pie de figura.}
\label{Fig1}
\end{center}
\end{figure}
```

Elementos flotantes

Float Placing Permissions.

Spec	Permission to place the float ...
------	-----------------------------------

- | | |
|---|---|
| h | <i>here</i> at the very place in the text where it occurred. This is useful mainly for small floats. |
| t | at the <i>top</i> of a page |
| b | at the <i>bottom</i> of a page |
| p | on a special <i>page</i> containing only floats. |
| ! | without considering most of the internal parameters ^a , which could otherwise stop this float from being placed. |

^aSuch as the maximum number of floats allowed on one page.

Tabular

```
\begin{tabular}{|c|c|}  
\hline  
\multicolumn{2}{|c|}{Ene} \\  
\hline  
Mene & Muh! \\  
\hline  
\end{tabular}
```

Ene	
Mene	Muh!

Table~\ref{Tbl1} shows...

```
\begin{table}[!htbp]
\begin{center}
\begin{tabular}{|r|||}
\hline
7C0 & hexadecimal \\
3700 & octal \\
\cline{2-2}
11111000000 & binary \\
\hline
1984 & decimal \\
\hline
\end{tabular}
\caption{Caption of this table.}
\label{Tbl1}
\end{center}
\end{table}
```

Table 1 shows...

7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

Table 1: Caption of this table.

Ecuaciones matemáticas

Add a squared and b squared to get c squared. Or, using a more mathematical approach:
 $a^2 + b^2 = c^2$

Add a squared and b squared to get c squared. Or, using a more mathematical approach: $a^2 + b^2 = c^2$

Add a squared and b squared to get c squared. Or, using a more mathematical approach

```
\begin{equation}
  a^2 + b^2 = c^2
\end{equation}
```

Einstein says

```
\begin{equation}
  E = mc^2 \label{clever}
\end{equation}
```

He didn't say

```
\begin{equation}
  1 + 1 = 3 \tag{dumb}
\end{equation}
```

This is a reference to `\eqref{clever}`.

Add a squared and b squared to get c squared. Or, using a more mathematical approach

$$a^2 + b^2 = c^2 \quad (3.1)$$

Einstein says

$$E = mc^2 \quad (3.2)$$

He didn't say

$$1 + 1 = 3 \quad (\text{dumb})$$

This is a reference to (3.2).

```

\begin{equation*}
P = \frac{\displaystyle{
\sum_{i=1}^n (x_i - x)
(y_i - y)}}
{\displaystyle{\left[
\sum_{i=1}^n (x_i - x)^2
\sum_{i=1}^n (y_i - y)^2
\right]^{1/2}}}
\end{equation*}

```

$$P = \frac{\sum_{i=1}^n (x_i - x)(y_i - y)}{\left[\sum_{i=1}^n (x_i - x)^2 \sum_{i=1}^n (y_i - y)^2 \right]^{1/2}}$$

1 Greek and Hebrew letters

α	<code>\alpha</code>	κ	<code>\kappa</code>	ψ	<code>\psi</code>	F	<code>\digamma</code>	Δ	<code>\Delta</code>	Θ	<code>\Theta</code>
β	<code>\beta</code>	λ	<code>\lambda</code>	ρ	<code>\rho</code>	ε	<code>\varepsilon</code>	Γ	<code>\Gamma</code>	Υ	<code>\Upsilon</code>
χ	<code>\chi</code>	μ	<code>\mu</code>	σ	<code>\sigma</code>	\varkappa	<code>\varkappa</code>	Λ	<code>\Lambda</code>	Ξ	<code>\Xi</code>
δ	<code>\delta</code>	ν	<code>\nu</code>	τ	<code>\tau</code>	φ	<code>\varphi</code>	Ω	<code>\Omega</code>		
ϵ	<code>\epsilon</code>	\omicron	<code>\omicron</code>	θ	<code>\theta</code>	ϖ	<code>\varpi</code>	Φ	<code>\Phi</code>	\aleph	<code>\aleph</code>
η	<code>\eta</code>	ω	<code>\omega</code>	υ	<code>\upsilon</code>	ϱ	<code>\varrho</code>	Π	<code>\Pi</code>	\beth	<code>\beth</code>
γ	<code>\gamma</code>	ϕ	<code>\phi</code>	ξ	<code>\xi</code>	ς	<code>\varsigma</code>	Ψ	<code>\Psi</code>	\daleth	<code>\daleth</code>
ι	<code>\iota</code>	π	<code>\pi</code>	ζ	<code>\zeta</code>	ϑ	<code>\vartheta</code>	Σ	<code>\Sigma</code>	\gimel	<code>\gimel</code>

Bibliography

```
\bibitem[label]{marker}
```

```
\cite{marker}
```

‘thebibliography’ environment

```
Part1~\cite{pa} has  
proposed that \ldots
```

```
\begin{thebibliography}{99}  
\bibitem{pa} H.~Partl:  
\emph{German \TeX},  
TUGboat Volume~9, Issue~1 (1988)  
\end{thebibliography}
```

Partl [1] has proposed that ...

Bibliography

[1] H. Partl: *German T_EX*, TUGboat
Volume 9, Issue 1 (1988)

Oetiker *et al.* (2016) have prepared a very nice document to learn more about \LaTeX . Another way to reference a paper from the references section is with (Oetiker *et al.*, 2016).

References

Zollner, C., Karnahl, T., Stange, G. (1976). "Input-output function and adaptation behaviors of the five early potentials registered with the earlobe-vertex pick-up," Archives of Oto-Rhino-Laryngology **212**, 23-33.

Oetiker, T., Partl, H., Hyna, I., Schlegl, E. (2016). "The Not So Short Introduction to \LaTeX 2 ϵ ". Free Software Foundation, Inc.

`\citet{Oetiker2016}` have prepared a very nice document to learn more about `\LaTeX`. Another way to reference a paper from the references section is with `\citep{Oetiker2016}`.

`\begin{thebibliography}{00}`

`\harvarditem[Zollner \emph{et al.}]{Zollner, Karnahl, and Stange}{1976}{Zollner1976}`

Zollner, C., Karnahl, T., Stange, G. (`\textbf{1976}`). "Input-output function and adaptation behaviors of the five early potentials registered with the earlobe-vertex pick-up," Archives of Oto-Rhino-Laryngology `\textbf{212}`, 23-33.

`\harvarditem[Oetiker \emph{et al.}]{Oetiker, Partl, Hyna, and Schlegl}{2016}{Oetiker2016}`

Oetiker, T., Partl, H., Hyna, I., Schlegl, E. (`\textbf{2016}`). "The Not So Short Introduction to `\LaTeX` 2 ϵ ". Free Software Foundation, Inc.

`\end{thebibliography}`

Don't forget **natbib**

Parte práctica

Instalación de MiKTeX



This website uses cookies to personalize content and ads. [Learn More](#) Accept

Getting MiKTeX

MiKTeX is available for selected operating systems.

Please check the [prerequisites](#) in order to find out whether your system is supported.

If your system is not (yet) supported: it is not too difficult to [build MiKTeX](#).

<https://miktex.org/download>

Windows Mac Linux Docker All downloads

Installer Portable Edition Command-line installer

To install a basic TeX/LaTeX system on Windows, download and run this installer.

Please read the [tutorial](#), if you want step-by-step guidance.

Date:	01/28/2024
File name:	basic-miktex-24.1-x64.exe
Size:	138.07 MB
SHA-256:	94ddd75e2b90309b75db6dbda7d8103fcebda4495b579695e925e885d2b92704

[Download](#)

Compilación de una plantilla ejemplo

The image displays two windows from the TeXworks application. The left window shows the source code for a LaTeX document, and the right window shows the compiled PDF output.

Source Code (Left Window):

```
% DOCUMENT CLASS
\documentclass[4,11pt,spanish]{article}

% PAQUETES
\usepackage[spanish,es-tabla]{babel}
\usepackage{amsmath,amssymb,amstext}
\usepackage{natbib}
\usepackage{graphics}
\usepackage[cm]{fullpage}
\usepackage{numbered, framed}{mcode}
\usepackage{colorlinks=true,allcolors=blue}{hyperref} % linkcolor, anchorcolor, citecolor, filecolor, menucolor, runcolor, urlcolor, allcolors || red, black, green, cyan, magenta
\setlength{\parskip}{0.5ex}

% TÍTULO
\title{Mi primer documento en \LaTeX}

% ASIGNATURA Y AUTOR
\author{\emph{Procesamiento de Señales Biomédicas} \ \ Universidad de Granada \ \ Alumno/\footnote{\href{mailto:Email_Alumno@correo.ugr.es}{Email: Email_Alumno@correo.ugr.es}} \ \ Curso 2024-2025}

% DOCUMENTO
\begin{document}

\maketitle{\small \tableofcontents} % Quitar comentario para mostrar tabla de contenidos
\date{}

\clearpage

% Sección 1
\section{Cómo insertar una referencia bibliográfica en un texto}
Un texto cualquiera citando una referencia \cite{Zollner1976}.

% Sección 2
\section{Figuras y tablas}
\subsection{Figuras}
La figura-\ref{fig:EtiquetaFigura} muestra...
\begin{figure}[htb]
\begin{center}
\includegraphics[width=8cm]{Archivos/Figura3D}
\caption{Pie de figura.}
\label{fig:EtiquetaFigura}
\end{center}
\end{figure}
\subsection{Tablas}
La tabla-\ref{tbl:EtiquetaTabla} presenta...
\begin{table}[htbp]
\begin{center}
\begin{tabular}{|l|}
\hline
\hline
700 & hexadecimal \\\
3700 & octal \\\
\cline(2-2)
11111000000 & binario \\\
\hline
1984 & decimal \\\
\hline
\end{tabular}
\caption{Pie de tabla.}
\label{tbl:EtiquetaTabla}
\end{center}
\end{table}

% Sección 3
\section{Cómo utilizar listas}
\begin{enumerate}
\item Puedes anidar listas con mucha flexibilidad.
\begin{itemize}
\item Este es el símbolo por defecto.
\item Aunque también puedes utilizar un quón y otros símbolos a tu elección.

PDF Output (Right Window):



Mi primer documento en  $\LaTeX$



Procesamiento de Señales Biomédicas  
Universidad de Granada



Alumno*



Curso 2024-2025



28 de enero de 2025



Índice



|                                                           |   |
|-----------------------------------------------------------|---|
| 1. Cómo insertar una referencia bibliográfica en un texto | 2 |
| 2. Figuras y tablas                                       | 2 |
| 2.1. Figuras                                              | 2 |
| 2.2. Tablas                                               | 2 |
| 3. Cómo utilizar listas                                   | 2 |
| 4. Cómo utilizar ecuaciones matemáticas                   | 3 |
| A. Añadir código de matlab                                | 3 |



*Email: Email.Alumno@correo.ugr.es



1


```

Tarea para casa

- Subir a PRADO un documento PDF de tema libre generado a partir de la plantilla proporcionada, que contenga:
 - ✓ un título, vuestro nombre, vuestro email como pie de página
 - ✓ al menos una figura,
 - ✓ al menos una tabla,
 - ✓ al menos una lista,
 - ✓ al menos una ecuación en texto y otra aislada en el centro de una línea,
 - ✓ un apéndice con un script de MATLAB,
 - ✓ algún fragmento de texto en **negrita**, subrayado y *cursiva*, y
 - ✓ al menos una referencia bibliográfica, una referencia a una tabla, una referencia a una figura y una referencia a una ecuación.
- Fecha límite: miércoles 5 de marzo, 2025.
- Calificación numérica de 0—10 en el apartado de evaluación continua.

Referencias

The Not So Short Introduction to L^AT_EX

Or B_TE_X in 280 minutes



Tobias Oetiker • Marcin Serwin

Hubert Partl • Irene Hyna • Elisabeth Schlegl

Nightly version 7.0@81a652a67041cd73809ada1a11c5968600594c58,
August 30, 2023

The not so short Introduction to LaTeX (2023).
Oetiker T, Serwin M, Partl H, Hyna I, Schlegl E.

Copyright © 1995–2022 Tobias Oetiker, Marcin Serwin,
Hubert Partl, Irene Hyna, Elisabeth Schlegl and Contributors.

Available in Open Access

<https://tobi.oetiker.ch/lshort/lshort.pdf>