LaTeX Workshop

Encontro Nacional de Estudantes de Informática

by *Ricardo Sousa*

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Faculdade de Engenharia
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Outline.

Outline.

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What is LaTeX?

- LaTeX is a typesetting system;
- Allows the production of scientific (and non-scientific) documents;
- High-quality results.

*Check references of this presentation for further information.

LaTeX in a nutshell.

Save following lines in a file named: minimal.tex

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

and then, on the command line (run twice at least):

```
$ pdflatex minimal
...
$ pdflatex minimal
```

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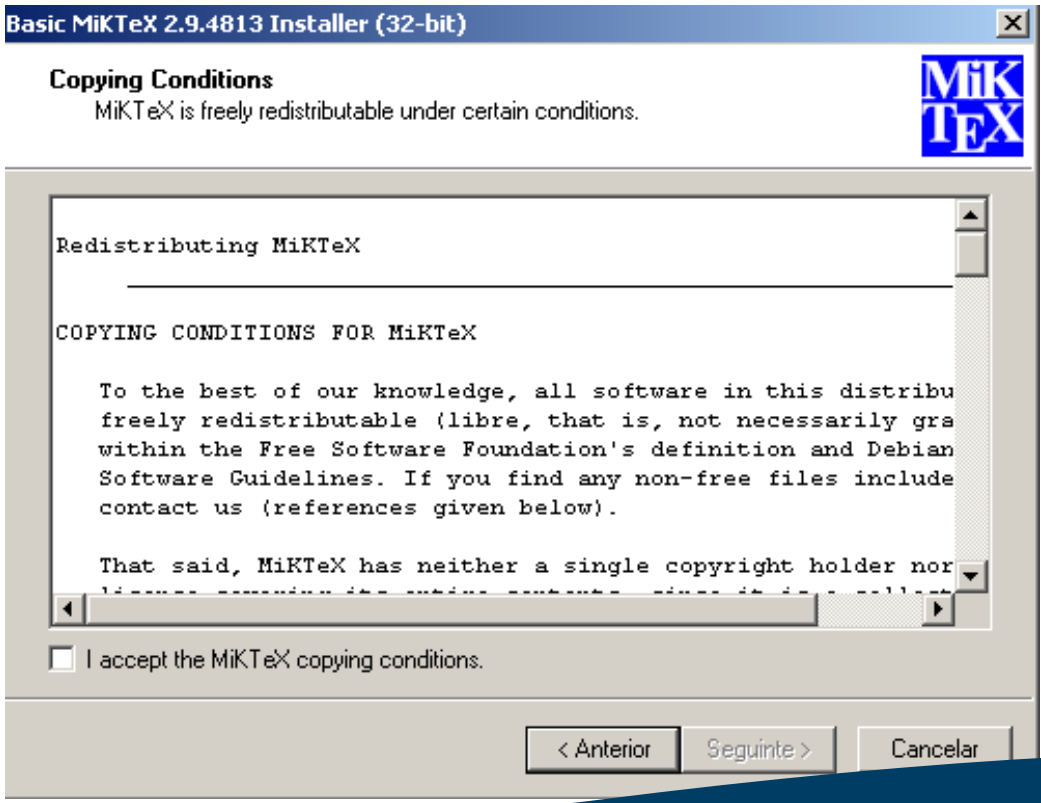
Installing LaTeX.

Figure: MiKTeX homepage.

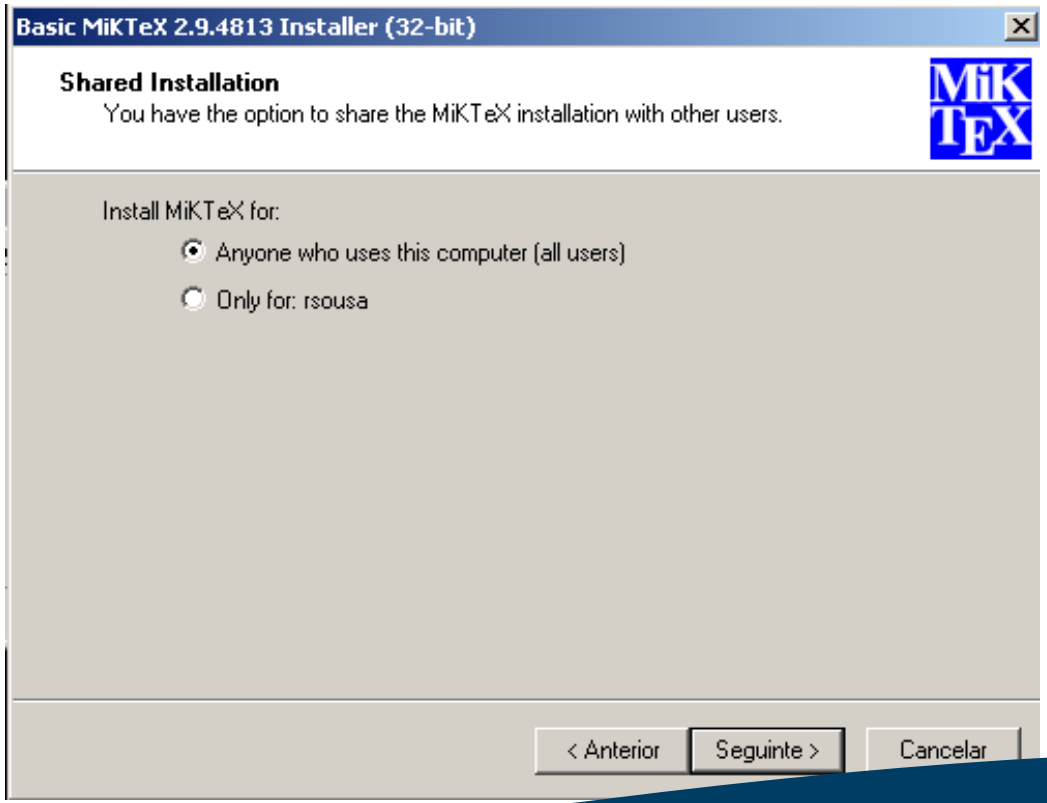
Installing LaTeX.

Figure: MiKTeX conditions.



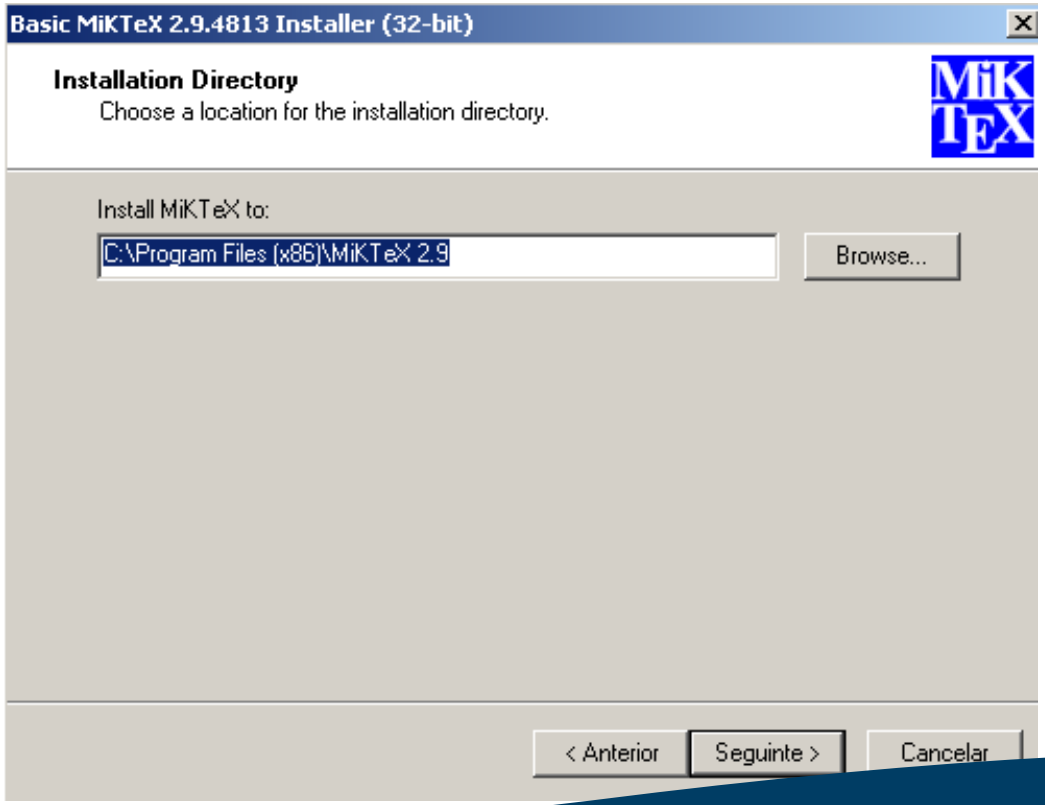
Installing LaTeX.

Figure: Standard configuration access profile.



Installing LaTeX.

Figure: Installation directory.



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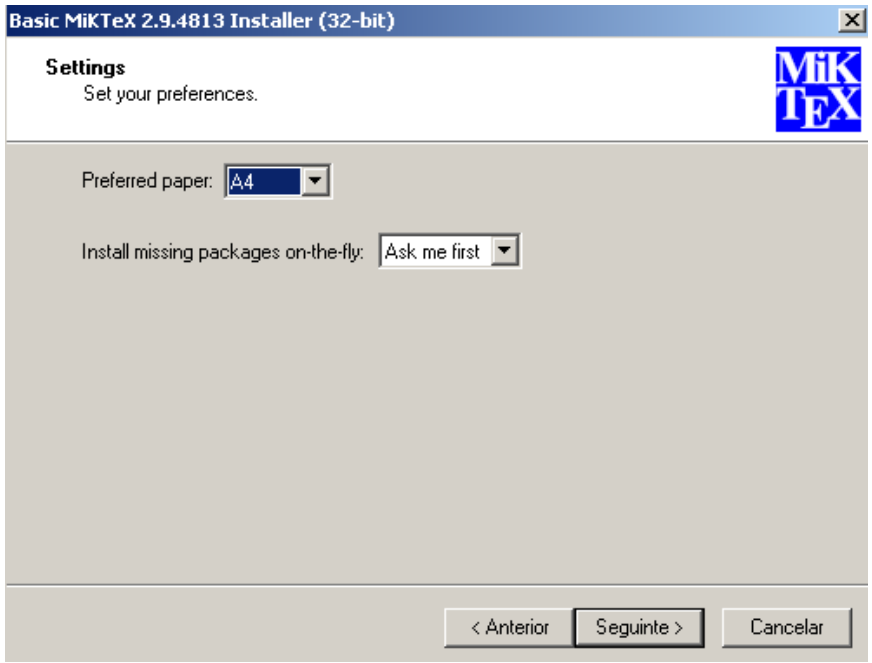
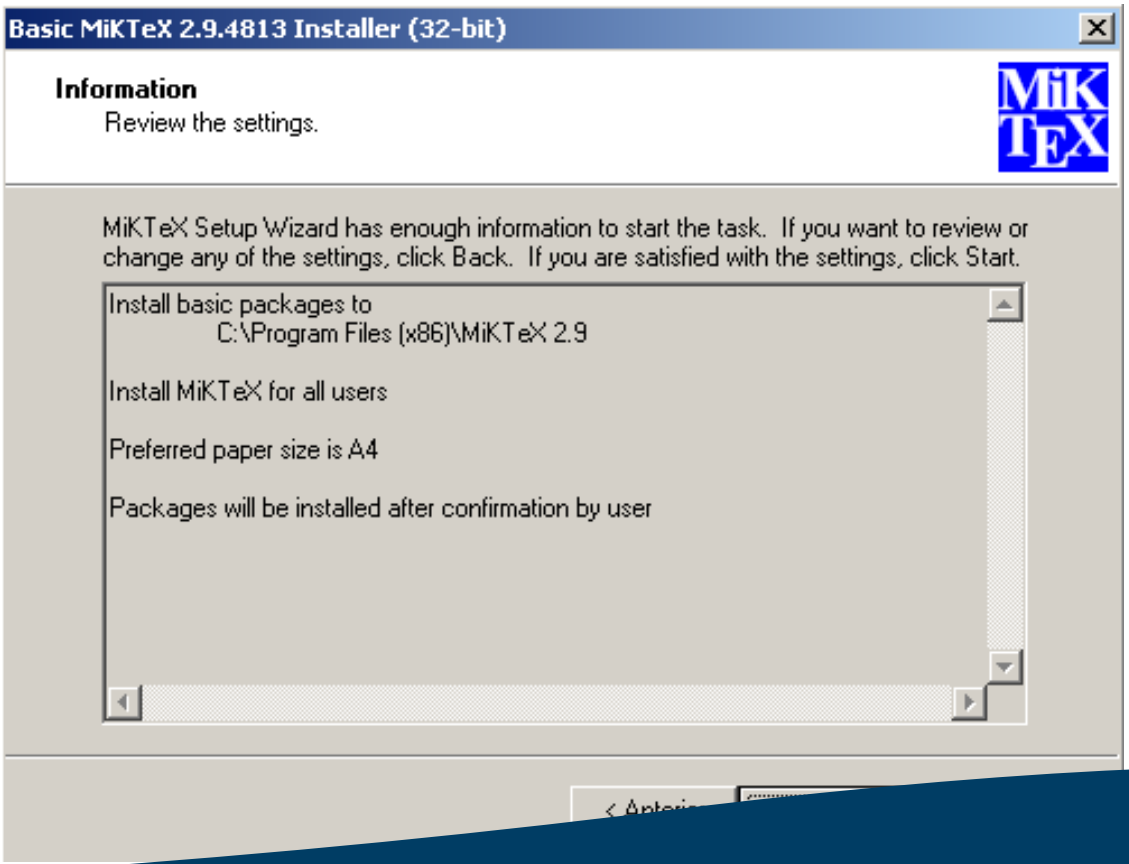
Installing LaTeX.

Figure: Some customizations (can be changed afterwards).



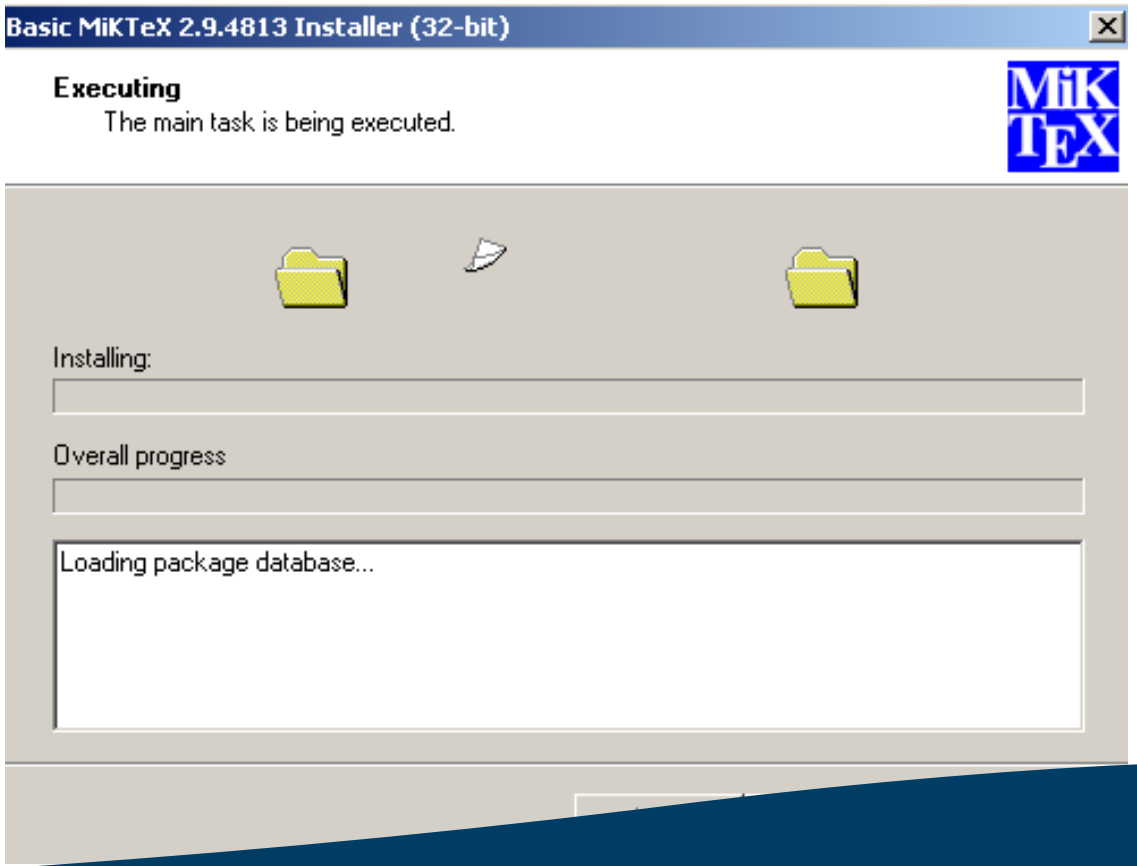
Installing LaTeX.

Figure: Review installation settings.



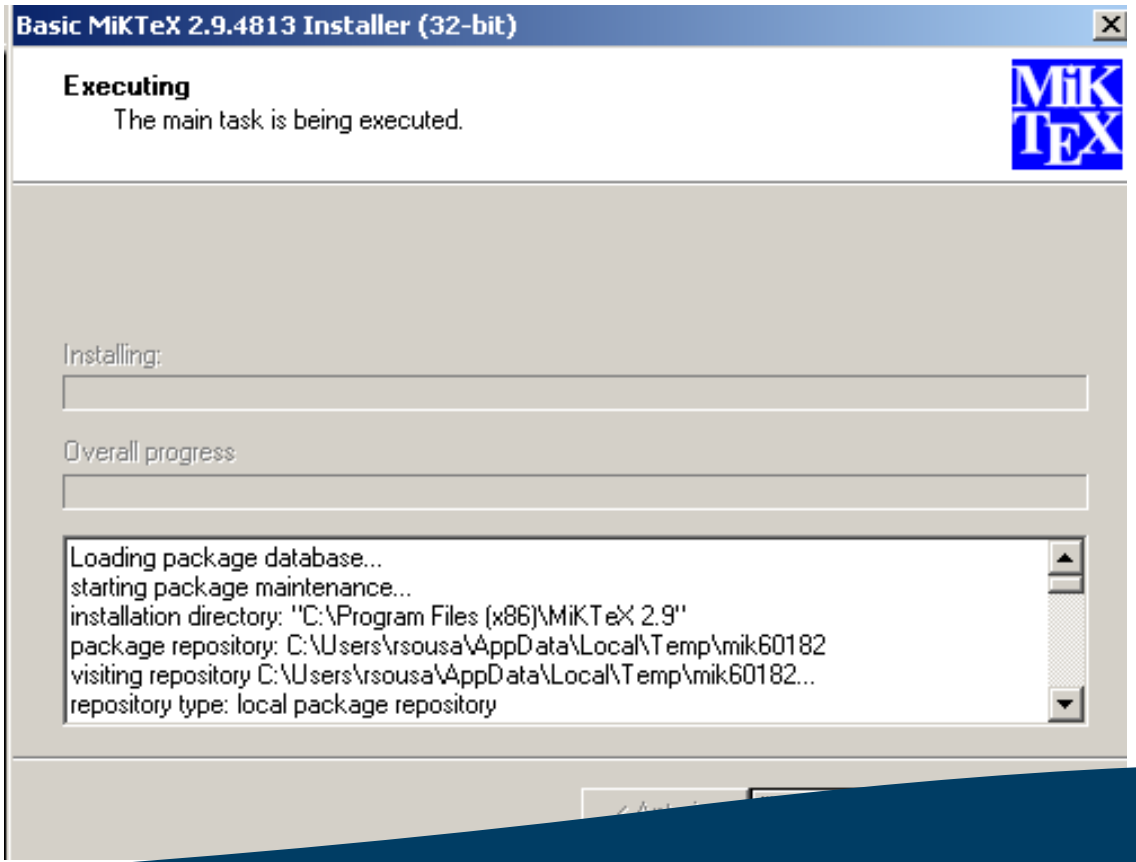
Installing LaTeX.

Figure: Installation (this may take a while).



Installing LaTeX.

Figure: Installation (finished).



Installing LaTeX.

Figure: Installation finished.

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Installing MiKTeX Portable.

Figure: MiKTeX Portable Homepage.

Outline.

Maintaining LaTeX Updated - Part I.

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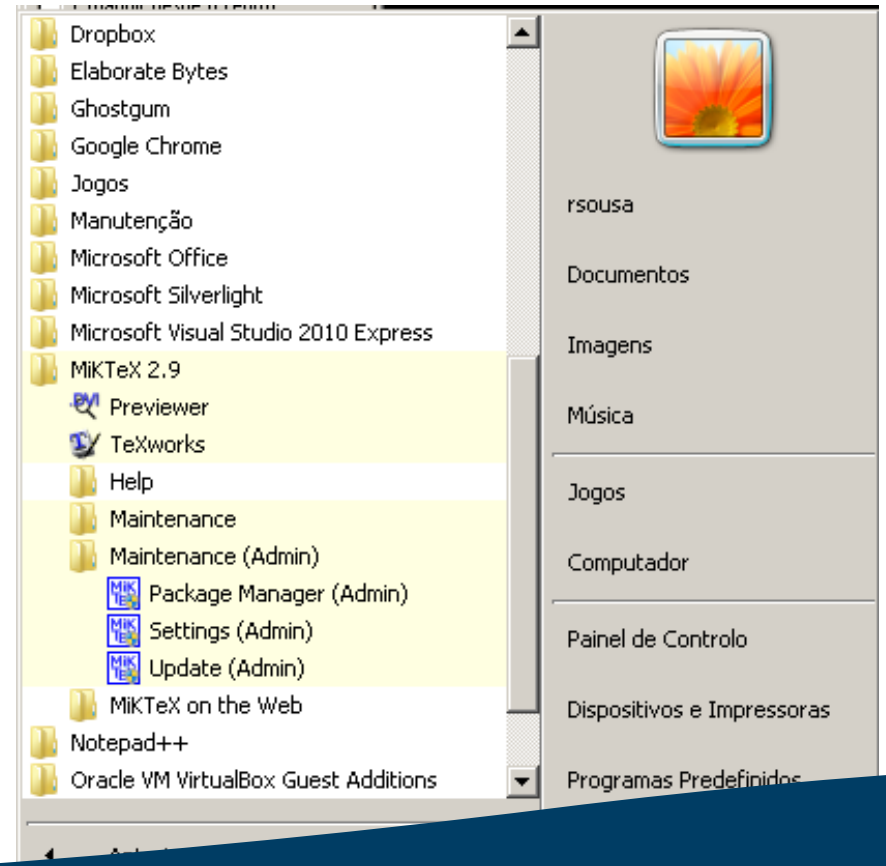
Maintaining LaTeX Updated - Part I.

Figure: MiKTeX maintenance options (select update).



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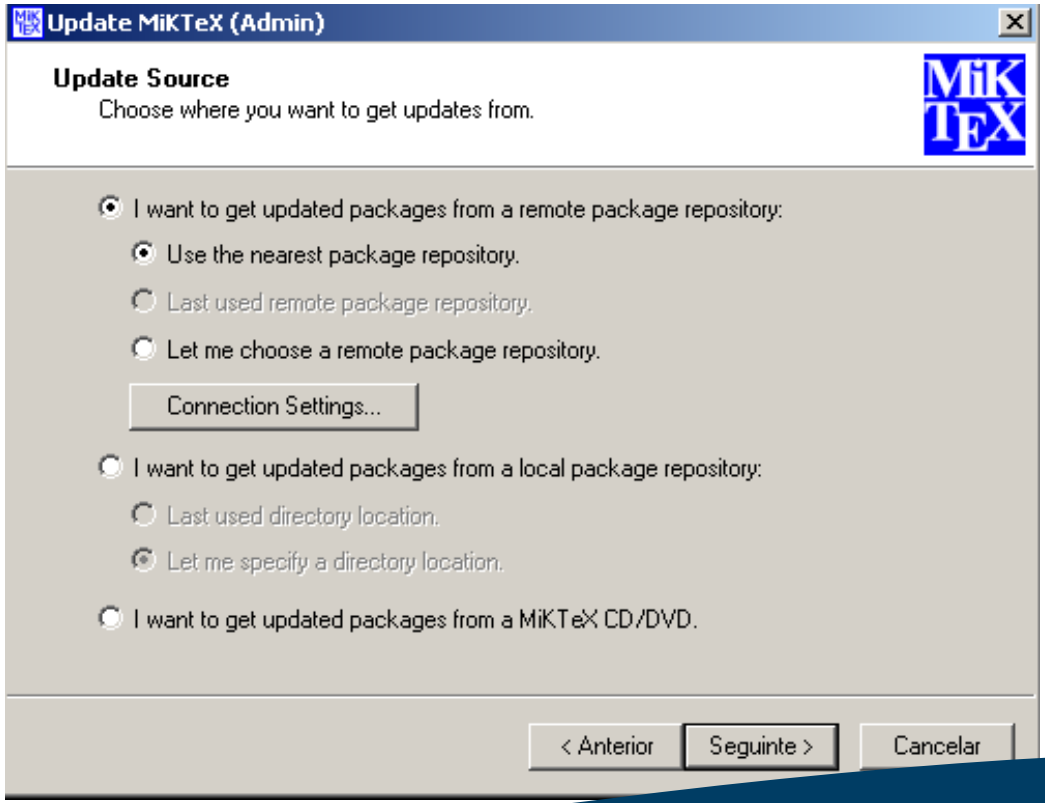
Maintaining LaTeX Updated - Part I.

Figure: Select updates sources.



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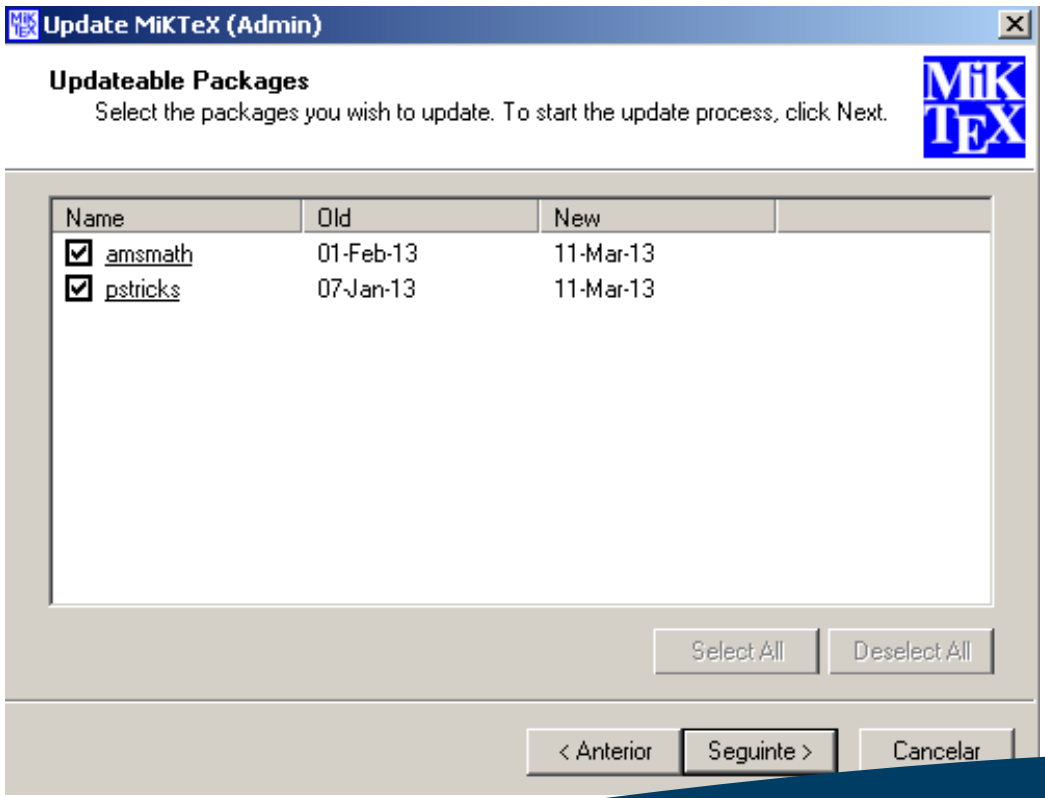
Maintaining LaTeX Updated - Part I.

Figure: Example of packages to be updated.



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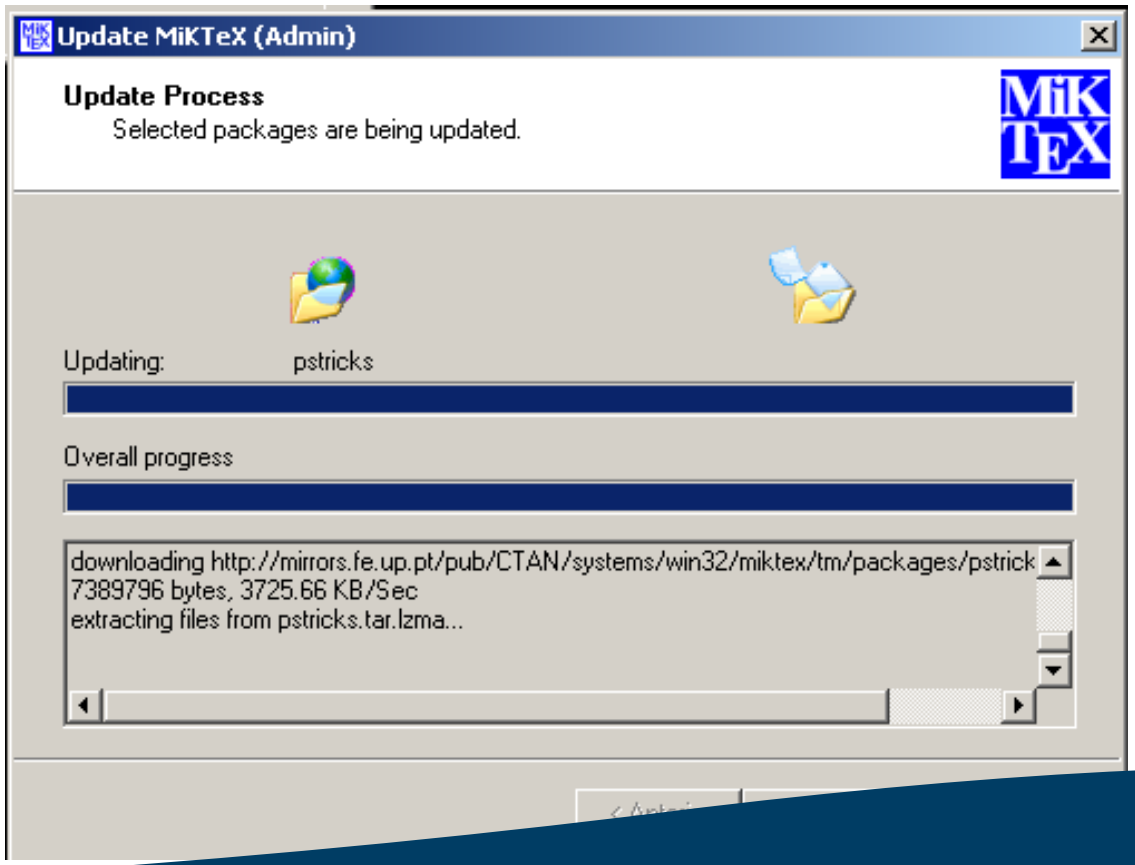
Maintaining LaTeX Updated - Part I.

Figure: Update ongoing.



Maintaining LaTeX Updated - Part I.

Figure: Update conclusion.

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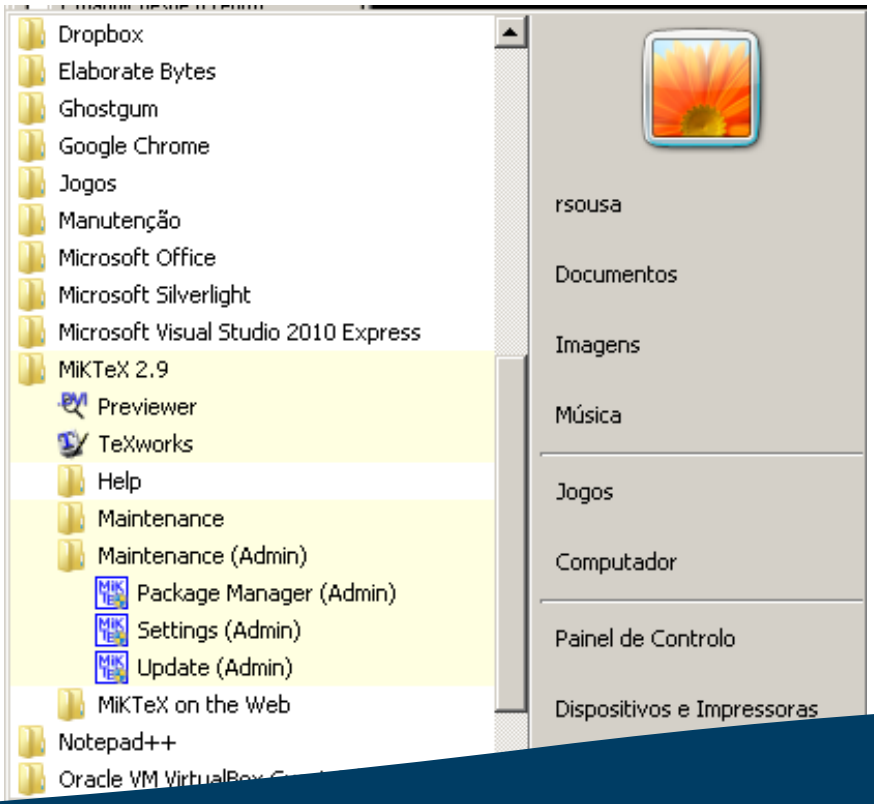
Maintaining LaTeX Updated - Part II.

Figure: MiKTeX maintenance options (select package manager).



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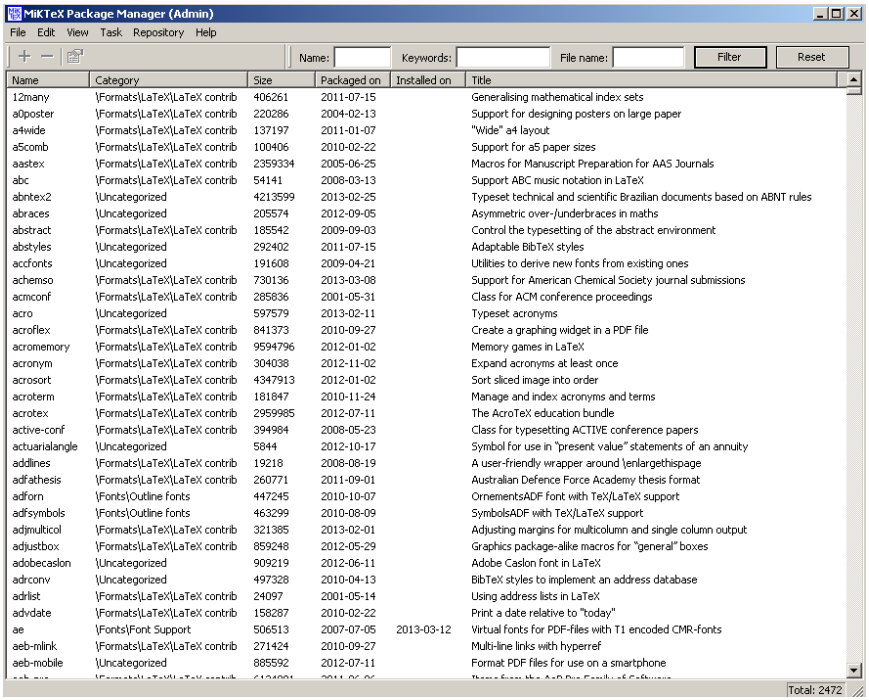
Maintaining LaTeX Updated - Part II.

Figure: Packages listing.



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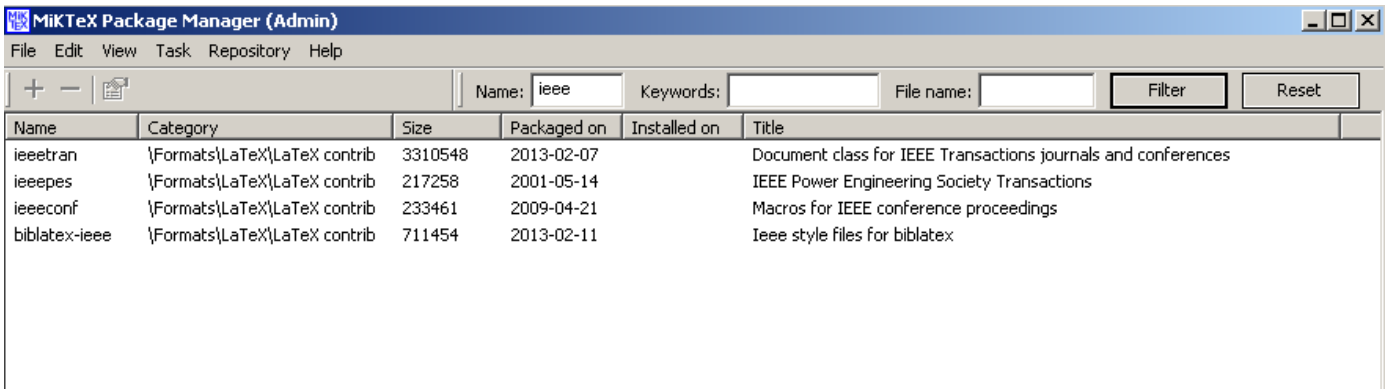
Maintaining LaTeX Updated - Part II.

Figure: Search for "ieee" package.



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Maintaining LaTeX Updated - Part II.

Figure: You can install by clicking in the "+" sign.

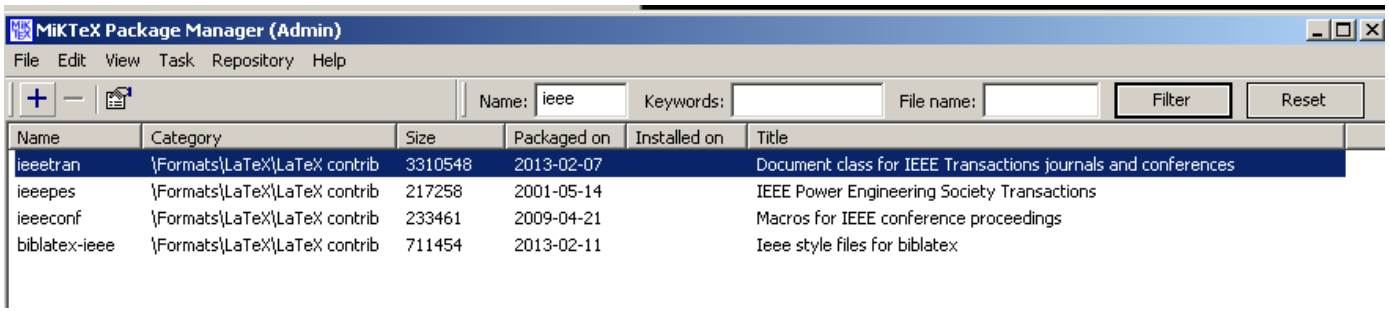

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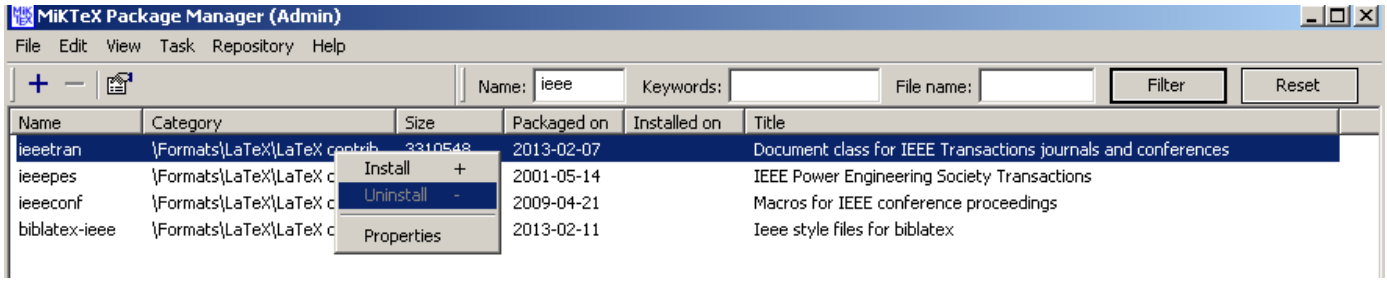
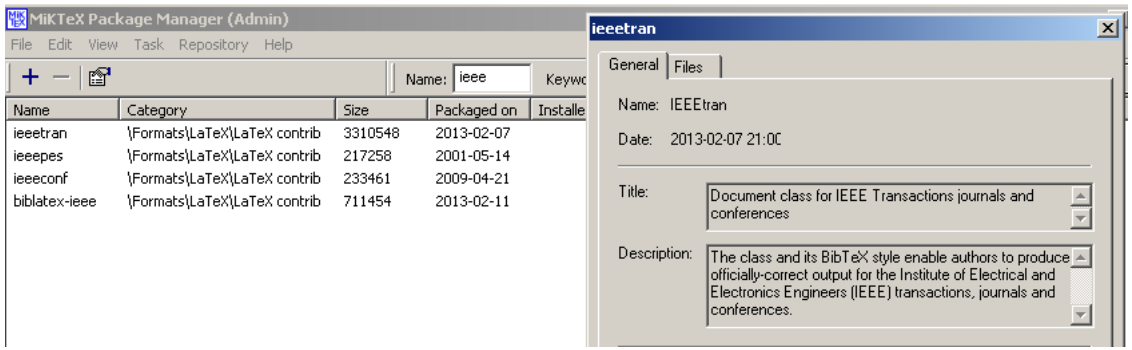
Figure: Or by pressing the right mouse button.



Maintaining LaTeX Updated - Part II.

Figure: Package description.



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Maintaining LaTeX Updated - Part II.

Figure: Installation confirmation box.

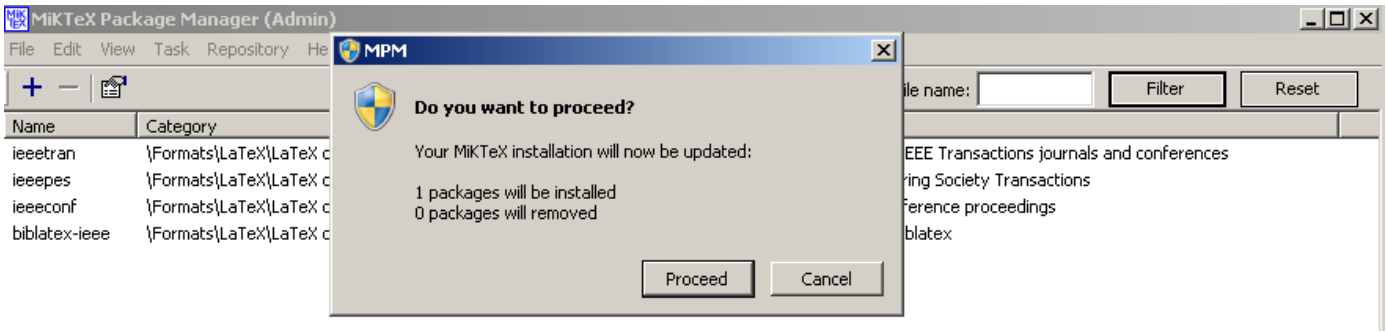

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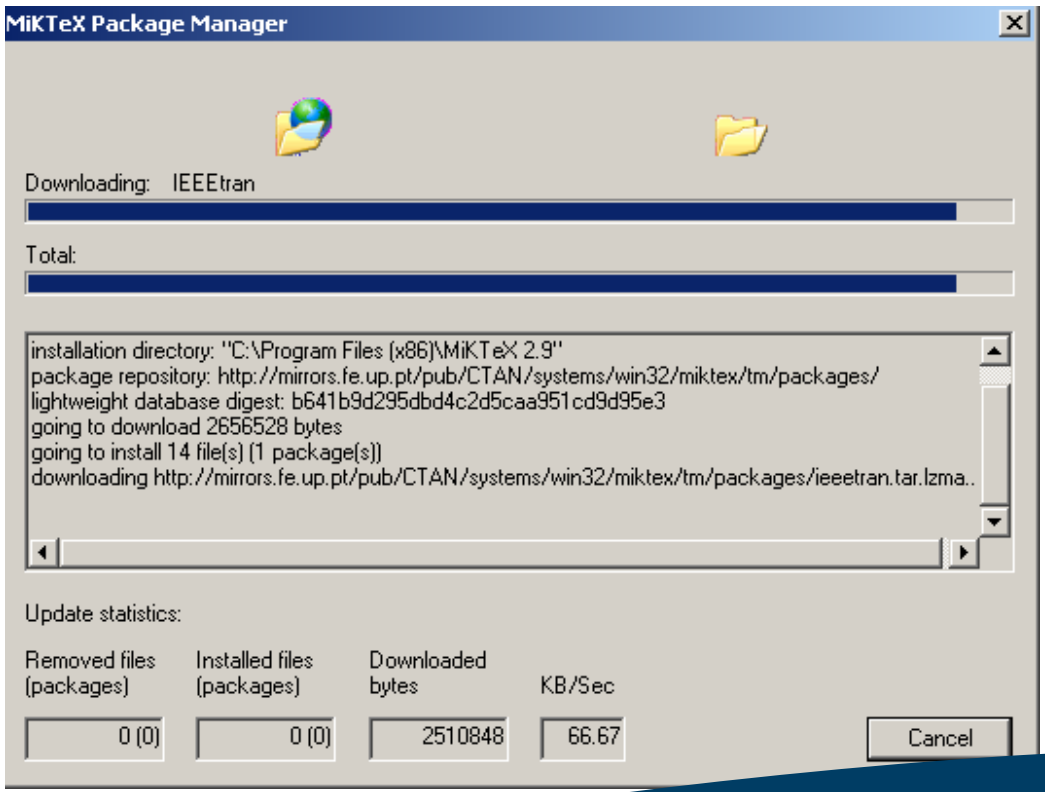
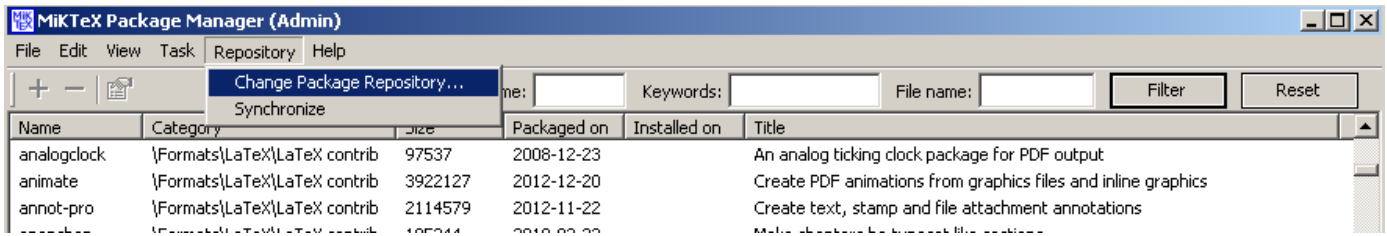
Figure: Installation.



Maintaining LaTeX Updated - Part II.

Figure: Changing package repository.



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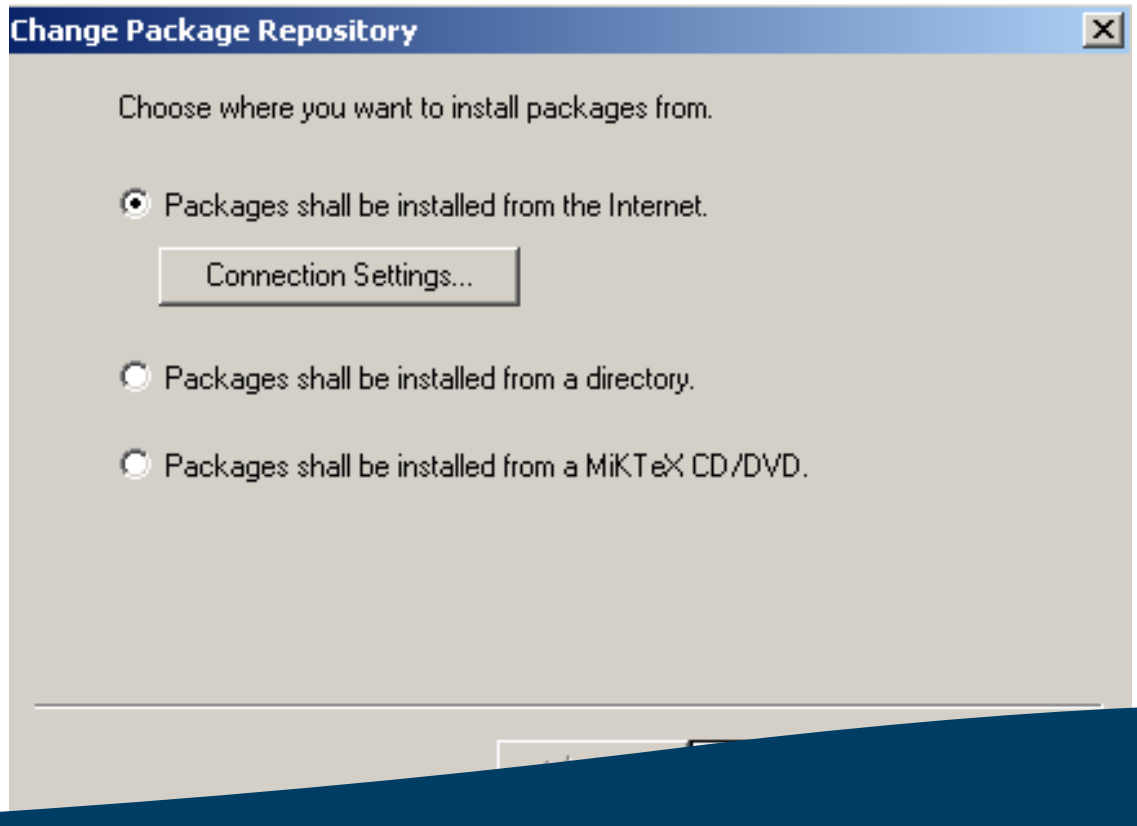
Maintaining LaTeX Updated - Part II.

Figure: Select installation from internet for the most up to date packages.



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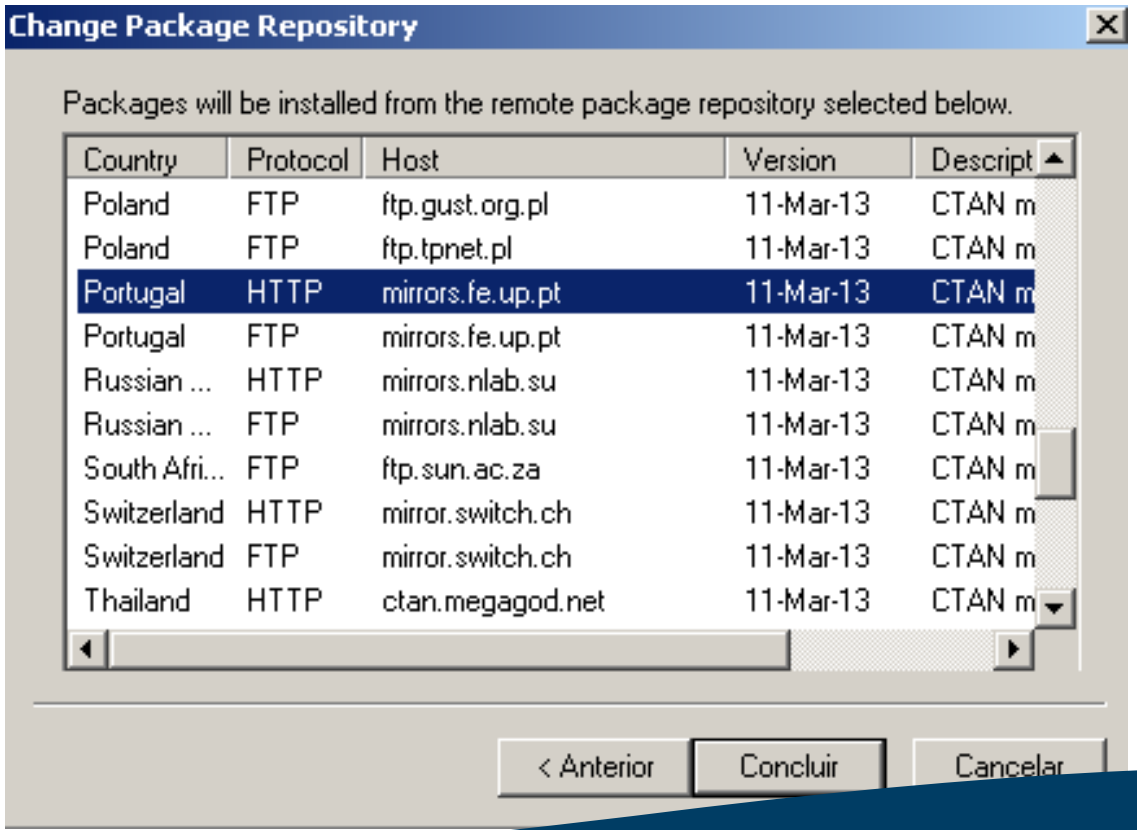
Maintaining LaTeX Updated - Part II.

Figure: Select the closest one.



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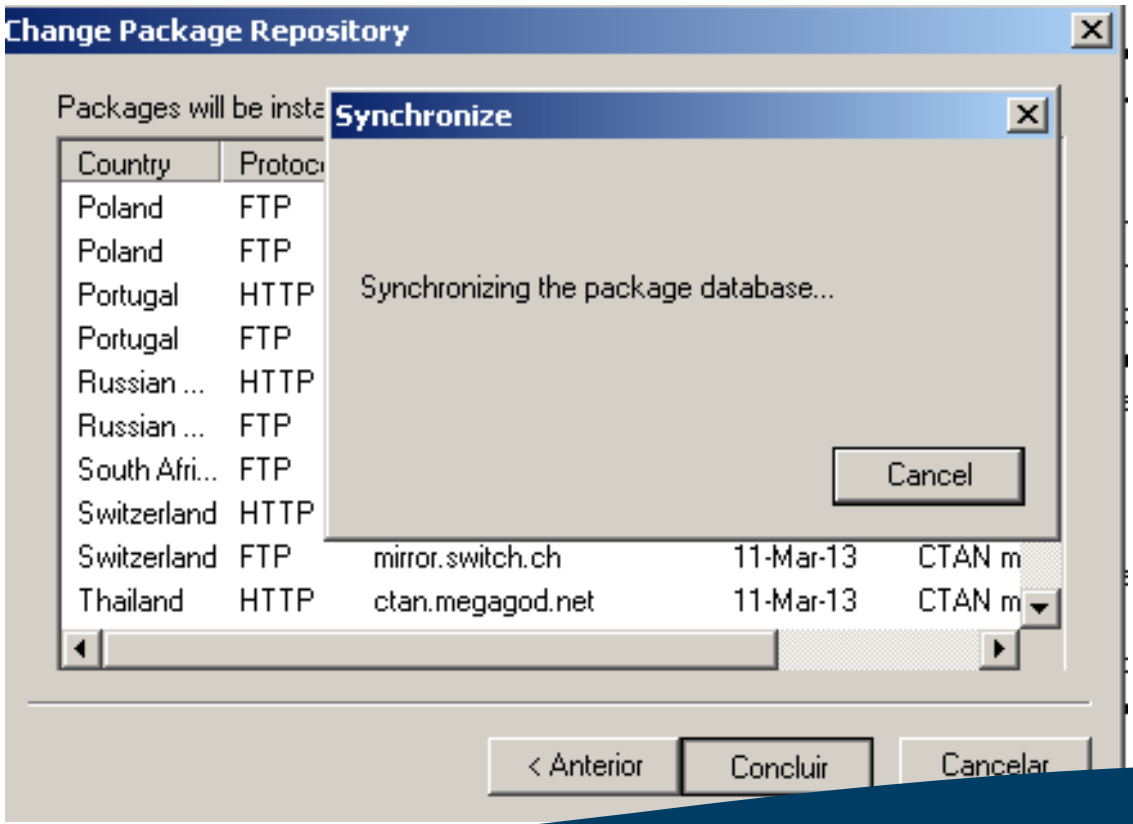
Maintaining LaTeX Updated - Part II.

Figure: And let it synchronize.



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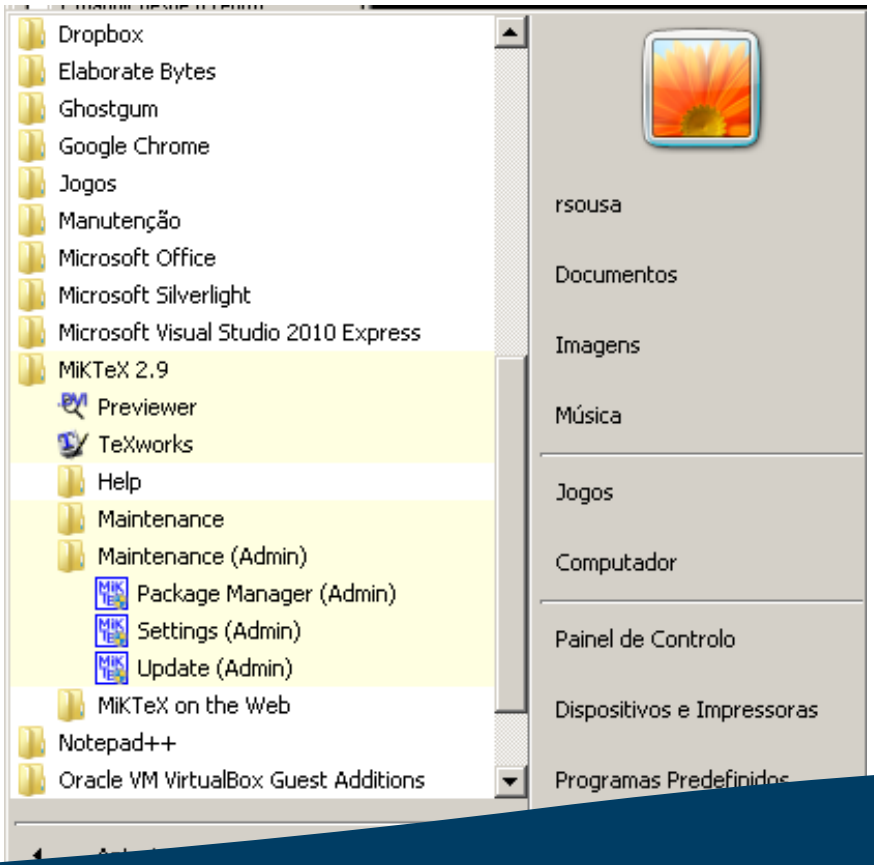
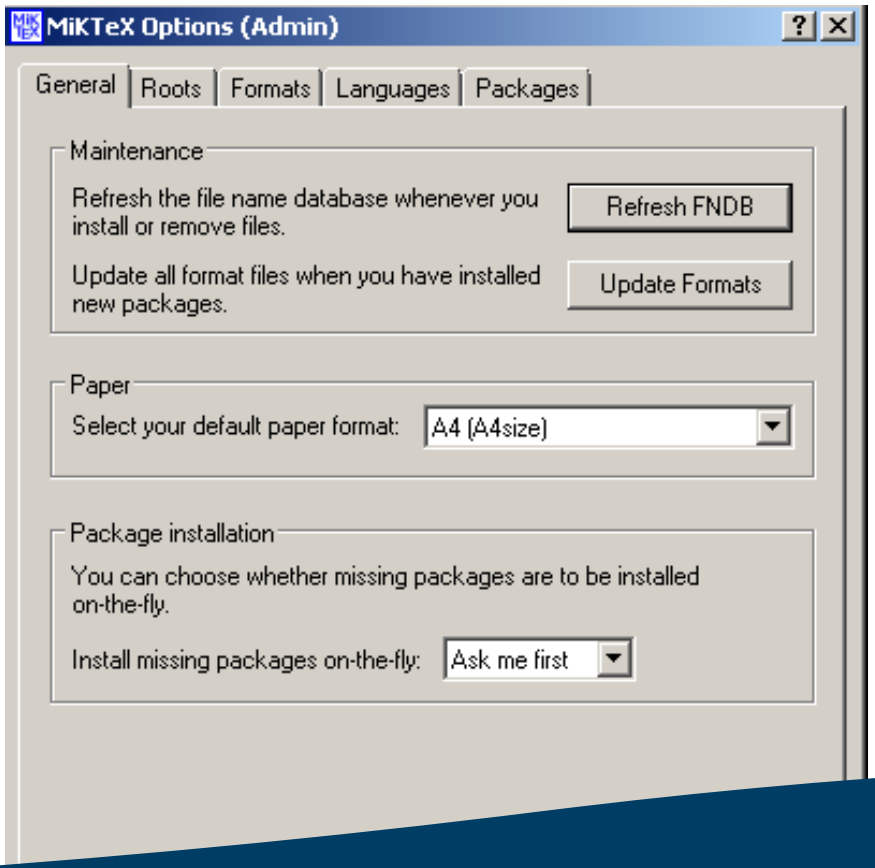
Maintaining LaTeX Updated - Part III.

Figure: MiKTeX maintenance options (select settings).



Maintaining LaTeX Updated - Part III.

Figure: Change settings.



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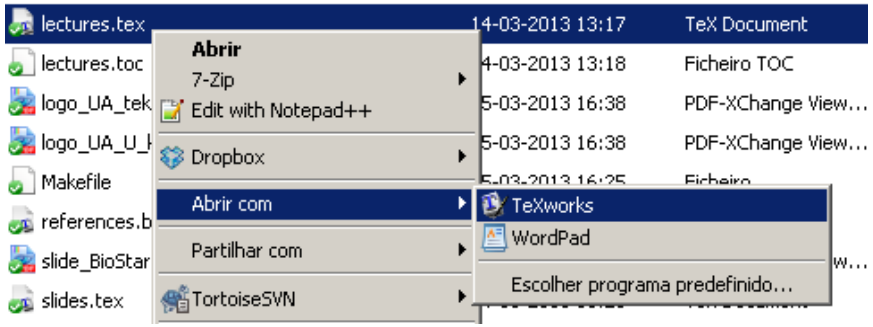
User Interface: TeXworks

Figure: Right click on the main LaTeX file and press "open with" TeXworks.



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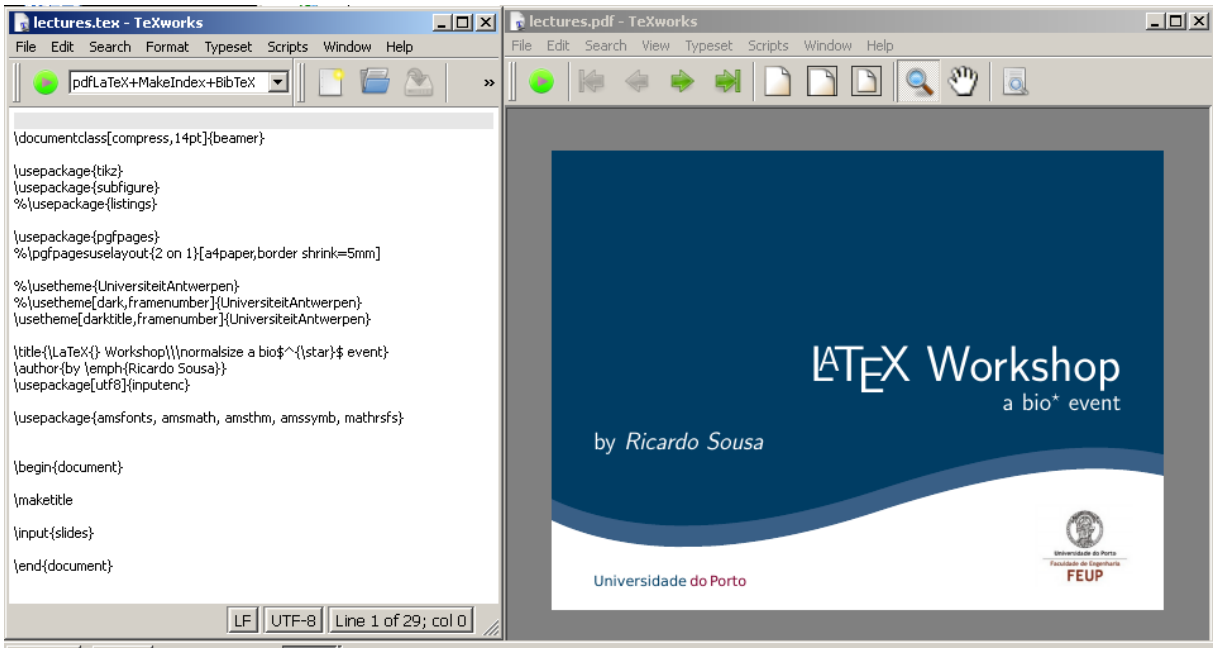
User Interface: TeXworks

Figure: Expected result (for this presentation).



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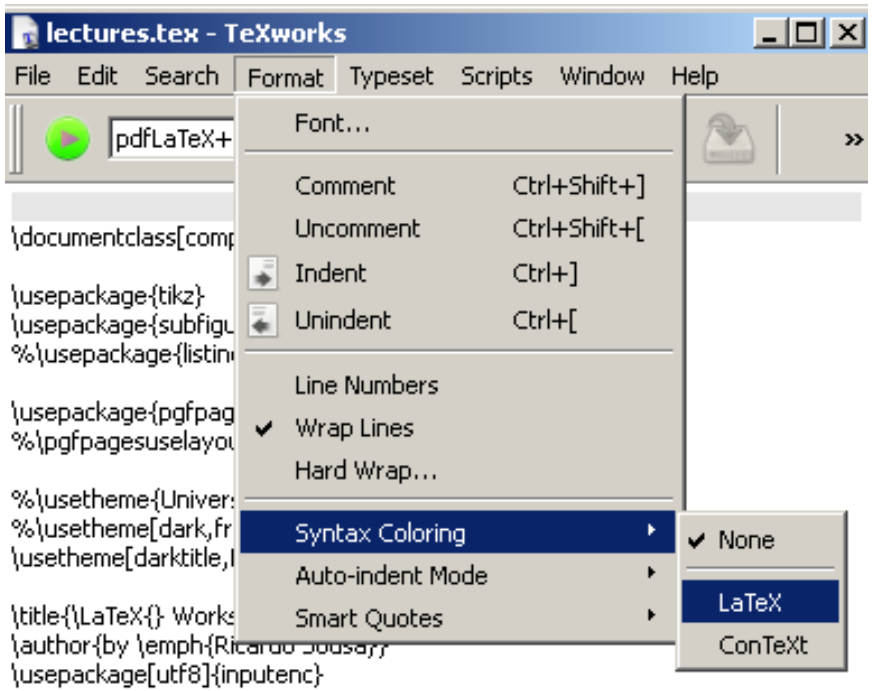
User Interface: TeXworks

Figure: Syntax highlight.



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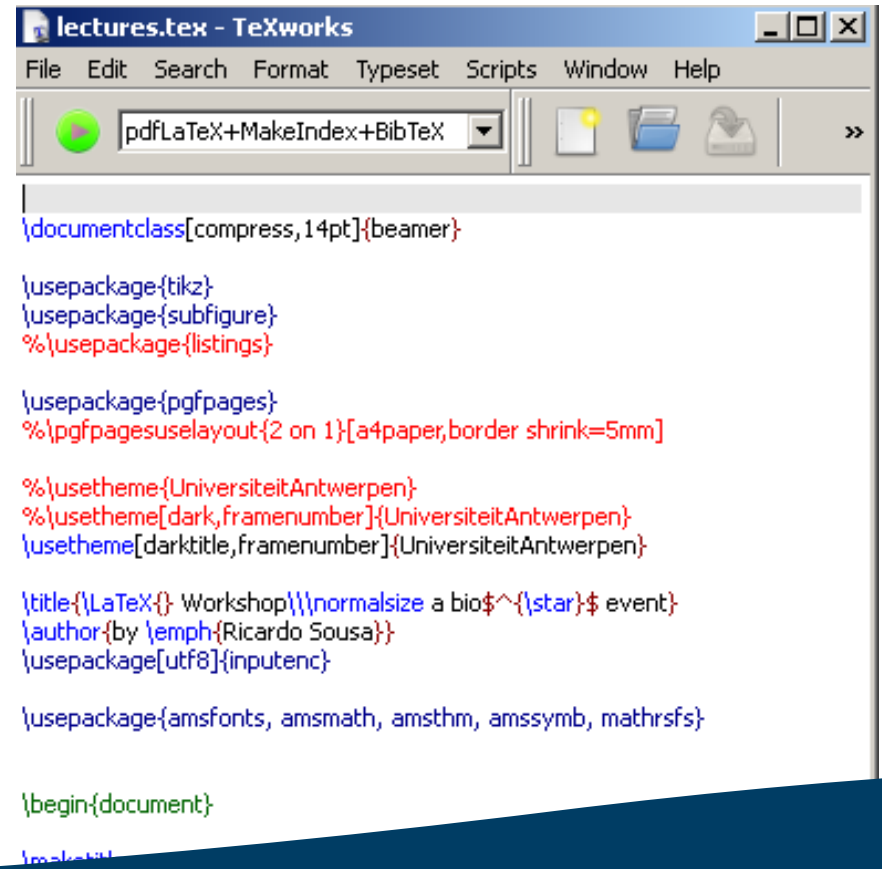
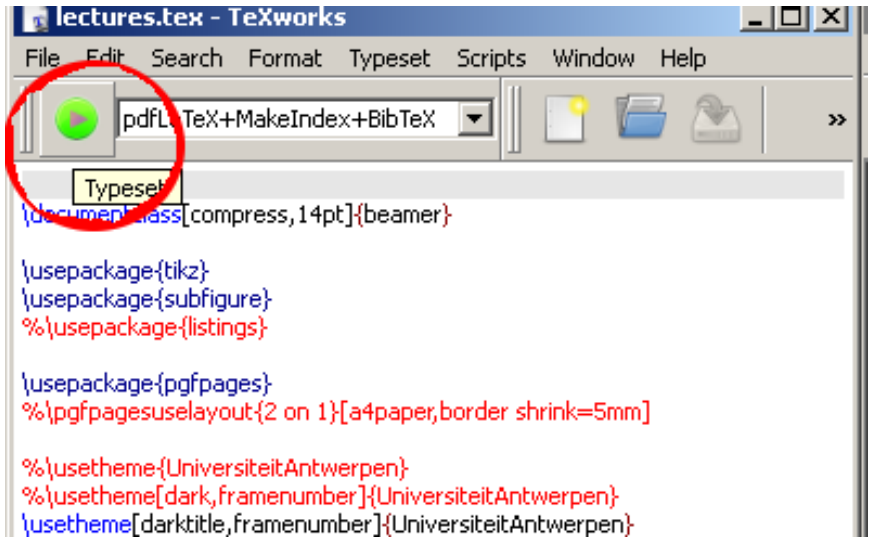
User Interface: TeXworks

Figure: Expected result.



TeXworks: Compiling.

Figure: Compiling.



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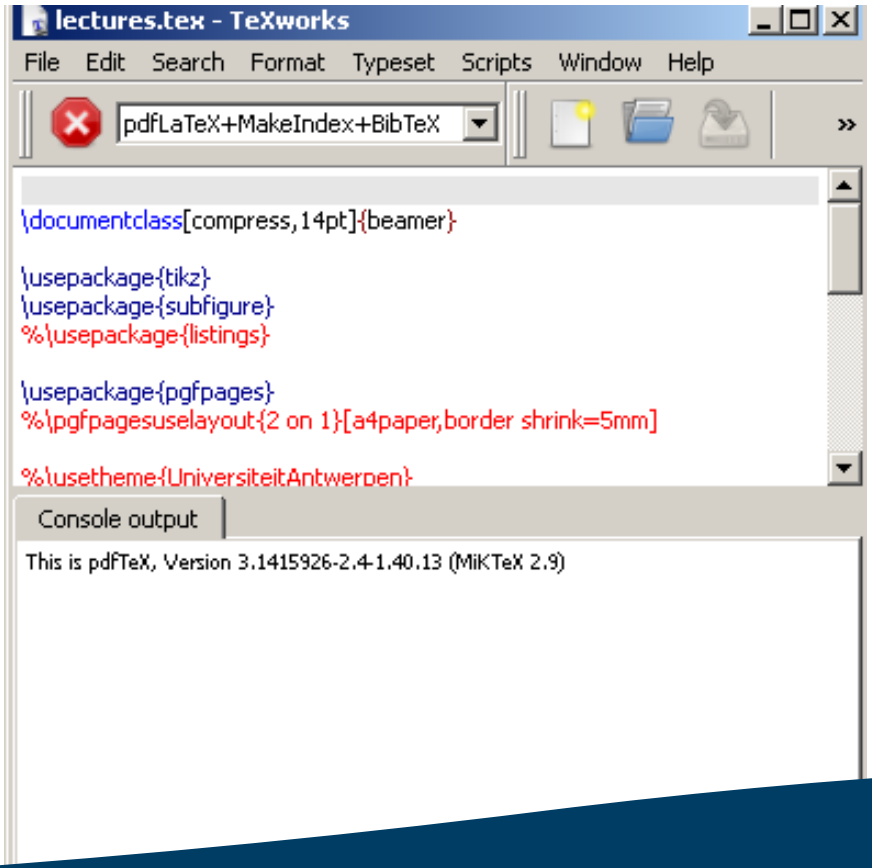
TeXworks: Compiling.

Figure: Console output.



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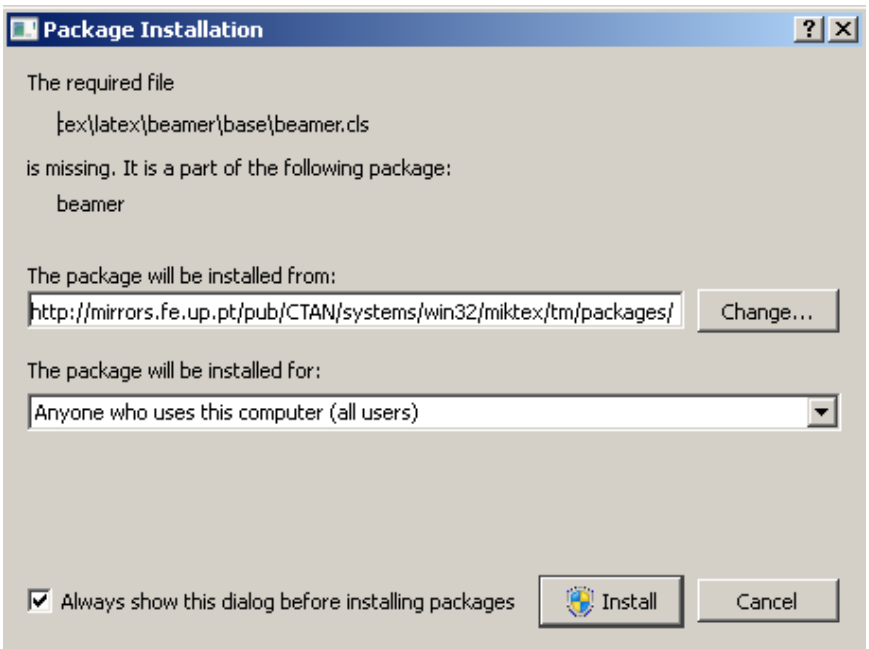
TeXworks: Compiling.

Figure: Pop-up window to install missing packages.



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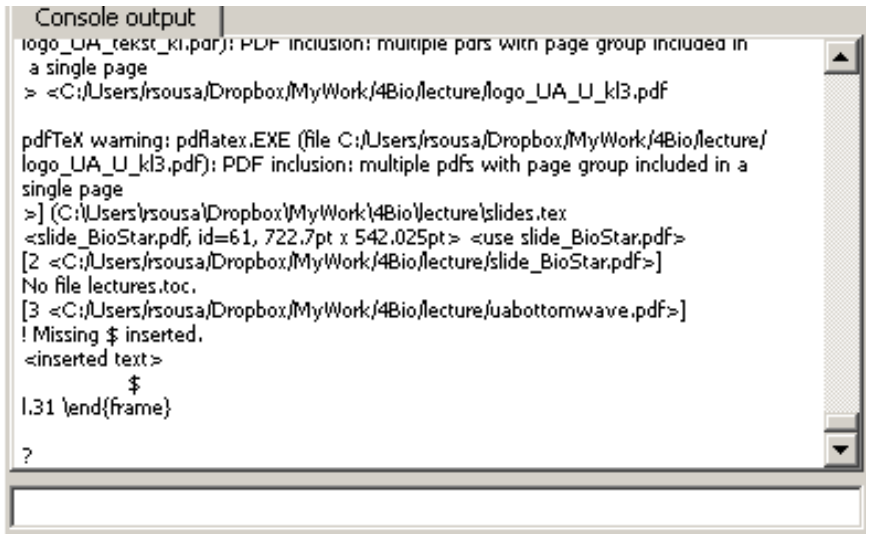
TeXworks: Compiling.

Figure: Compilation unsuccessful.



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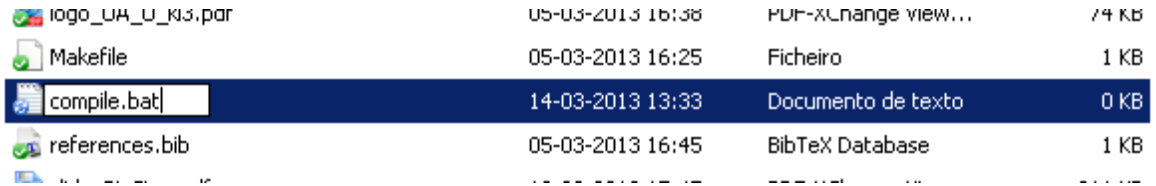
Command line compilation.

Figure: Generating compile script.



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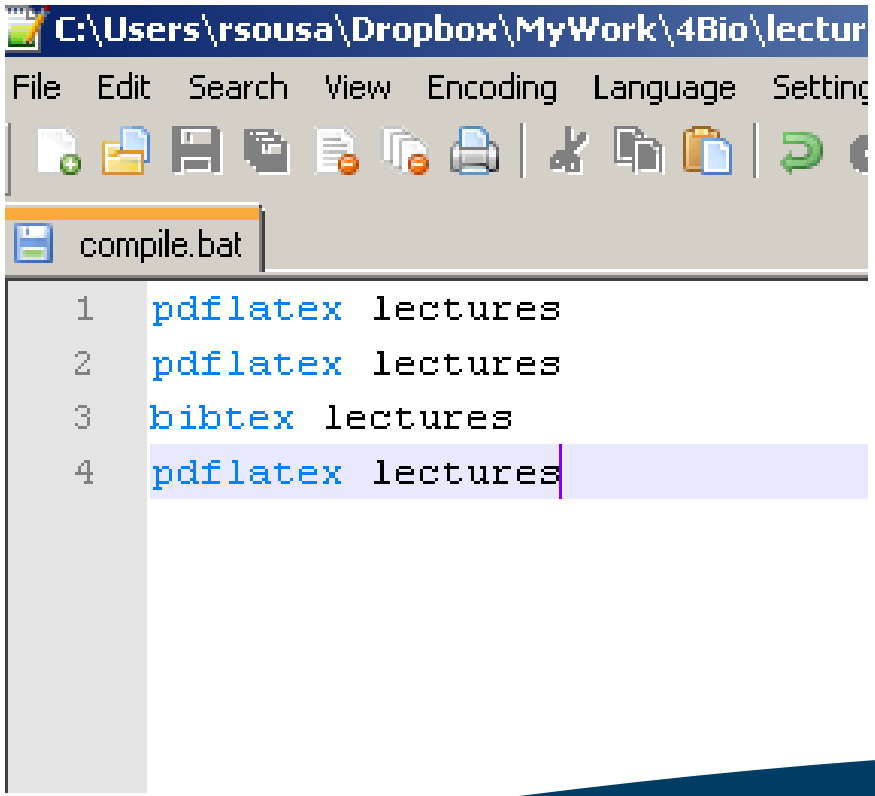
Command line compilation.

Figure: 3 main lines of code.



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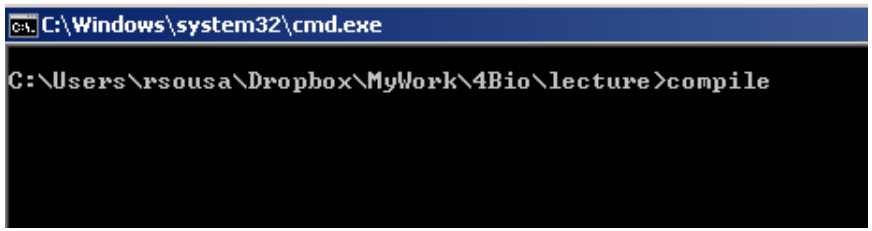
Command line compilation.

Figure: Open a command line window



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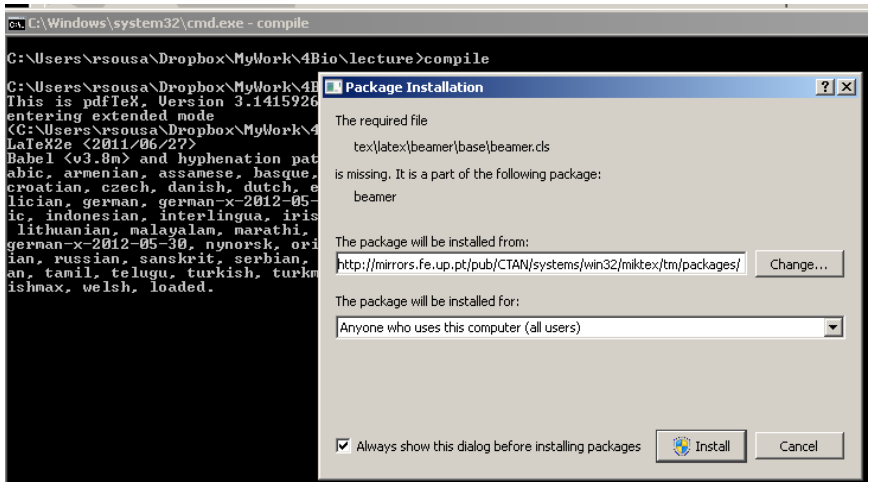
Command line compilation.

Figure: Pop-up window to install missing packages.



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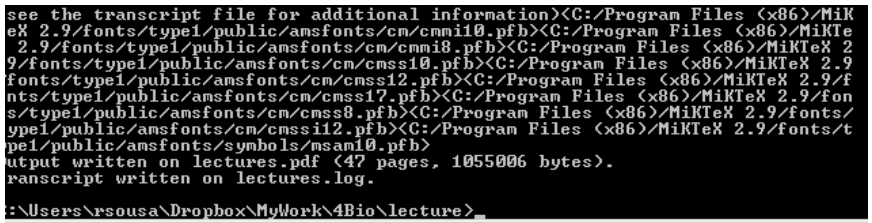
Command line compilation.

Figure: Compilation successful.



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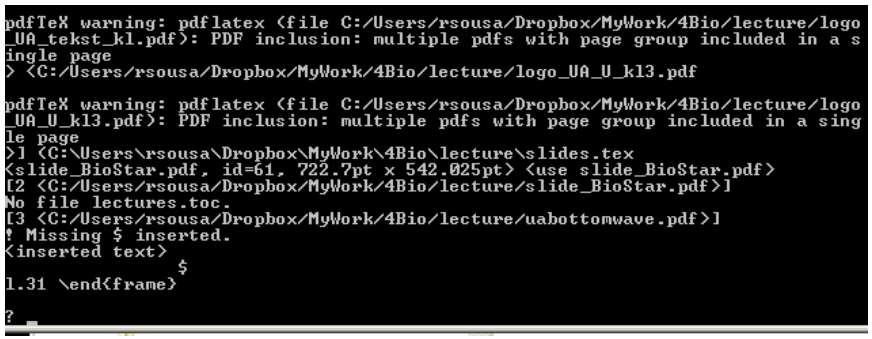
Command line compilation.

Figure: Compilation unsuccessful.



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Command line compilation.

Figure: Good practice: erase those auxiliary files.

compile.bat

```
1  del /F *.log *.out *.bbl *.blg
2
3  pdflatex lectures
4  pdflatex lectures
5  bibtex lectures
6  pdflatex lectures
```

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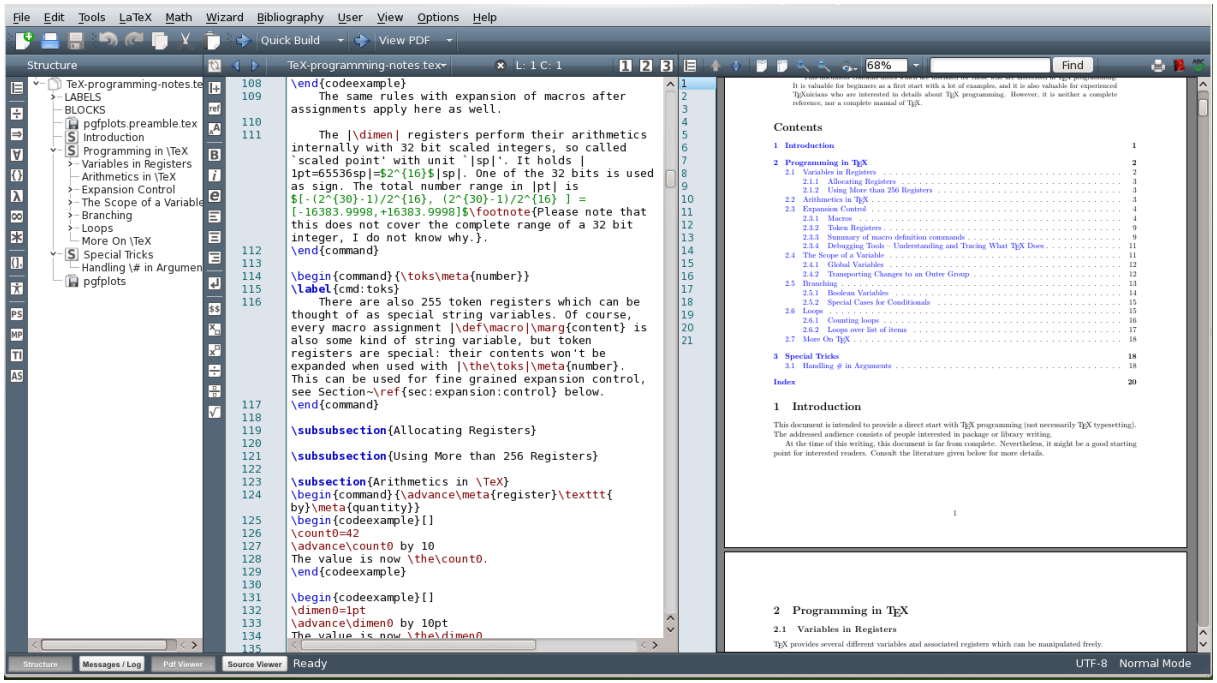
User Interface: Texmaker

Figure: Example.



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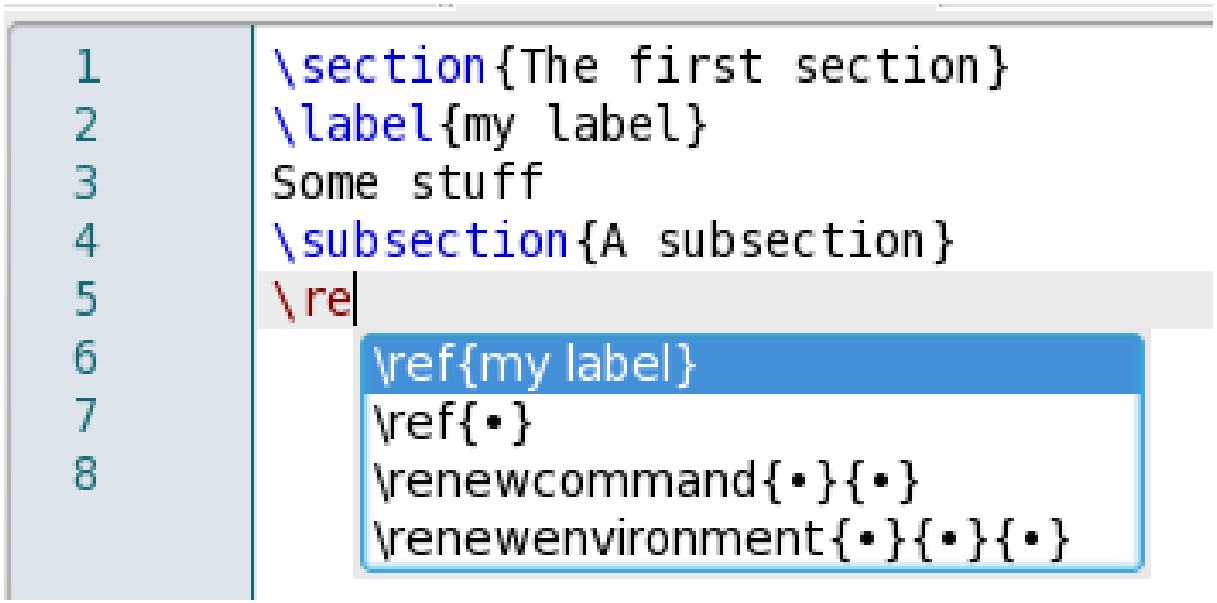
User Interface: Texmaker

Figure: Code completion.



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Outline.

Creating my first LaTeX Manuscript

```
\documentclass{article}
% preamble
\begin{document}
% core
\end{document}
```

Creating my first LaTeX Manuscript

Typical structure for an a4 paper with font size of 10 points:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\begin{document}
% core
\end{document}
```

Creating my first LaTeX Manuscript

Font encoding:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\begin{document}
% core
\end{document}
```

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Creating my first LaTeX Manuscript

Portuguese support:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage[portuguese]{babel}
\begin{document}
% core
\end{document}
```

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Creating my first LaTeX Manuscript

Different packages at your disposal:

1. `\usepackage{graphicx}`: figures;
2. `\usepackage{subfig}`: when working with multiple figures;
3. `\usepackage{cite}`: citations;
4. `\usepackage{amsmath}`: mathematical features;
5. `\usepackage{amssymb}`: mathematical symbols;
6. and lots more ...

Check `http://www.ctan.org`.

Creating my first LaTeX Manuscript

Creating Lists:
The itemize environment is for simple lists, the enumerate environment for enumerated lists, and the description environment for descriptions.

Creating my first LaTeX Manuscript

Follows some examples:

```
\begin{enumerate}
\item You can mix 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}
```

Creating my first LaTeX Manuscript

Including a figure:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}

\begin{document}
\begin{figure}
  \includegraphics{img.pdf}
\end{figure}
\end{document}
```

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```
{\tiny A}
{\scriptsize A}
{\footnotesize A}
{\small A}
{\normalsize A}
{\large A}
{\Large A}
{\LARGE A}
{\huge A}
{\Huge A}
```

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Including a figure:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}
  \includegraphics{img.pdf}
\end{figure}
End of document.
\end{document}
```

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Including a figure (Can you find the difference?):

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h]
  \includegraphics{img.pdf}
\end{figure}
End of document.
\end{document}
```

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Including a figure (Can you find the difference?):

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h] % <-------------- LOOK!!
  \includegraphics{img.pdf}
\end{figure}
End of document.
\end{document}
```

Floating Bodies.

How it affects the document?

- to place a figure/table right here (h);
- or at the bottom (b) of some page;
- or on a special floats page (p);
- and, all this even if it does not look that good (!)
- if no placement specifier is given: [tbp]

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To include figure between two paragraphs:

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h]
  \includegraphics{img.pdf}
\end{figure}

End of document.
\end{document}
```

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Can we change the image size? Yes!

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h]
  \includegraphics[width=0.5\textwidth]{img.pdf}
\end{figure}

End of document.
\end{document}
```

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Can we center the image? Of course!

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h]
  \centering
  \includegraphics[width=0.5\textwidth]{img.pdf}
\end{figure}

End of document.
\end{document}
```

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Can we center the image? Another way!

```
\documentclass[twoside,a4paper,10pt]{article}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\begin{document}

Logo.
\begin{figure}[!h]
  \begin{center}
  \includegraphics[width=0.5\textwidth]{img.pdf}
  \end{center}
\end{figure}

End of document.
\end{document}
```

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And what about captions? Easy stuff :)

```
\begin{figure}[!h]
  \centering
  \includegraphics[width=0.5\textwidth]{img.pdf}
  \caption{Faculty Logo.}
\end{figure}
```

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Including more than one figure.

```
\begin{figure}[!h]
  \centering
  \includegraphics[width=0.5\textwidth]{img.pdf}
  \includegraphics[width=0.5\textwidth]{img.pdf}
  \caption{Faculty Logo.}
\end{figure}
```

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However, we should use package 'subfig' which provides support for the inclusion of small, 'sub', figures and tables.

```
...
\usepackage{subfig}
\begin{document}
...
\begin{figure}[!h]
\subfloat[Imagem 1.]{\includegraphics[width=0.5\textwidth]{img.pdf}}
\subfloat[Imagem 2.]{\includegraphics[width=0.5\textwidth]{img.pdf}}
\end{figure}
```

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How to create tables? The simplest way is:

```
\begin{tabular}{ccc}
Evolutionary & SA & Simulated Annealing \\
\end{tabular}
```

- *tabular* is the environment for tables;
- Triple "c" for three columns with centered (c) text;
- "&" is the column separator;
- \\ is the new line;

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How to create tables? The simplest way is:

```
\begin{tabular}{|p{3cm}|c|c|}
Evolutionary & SA & Simulated Annealing \\
\end{tabular}
```

- besides "c" we can have:
  - `l`: left;
  - `r`: right;
  - `p{2cm}`: paragraph with 2cm width.
- we can also stylish our table by putting bars `|.|`

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How to create tables? The simplest way is:

```
\begin{tabular}{|p{3cm}|c|c|}
\hline
Evolutionary & ZO & Genetic Algorithm\\
Evolutionary & SA & Simulated Annealing \\
\hline
\end{tabular}
```

adding horizontal lines with `\hline`

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Merging cells (rows).

```
\usepackage{multirow}
...
\begin{document}
\begin{tabular}{|p{3cm}|c|c|}
\hline
\multirow{2}{*}{Evolutionary} & ZO & Genetic Algorithm\\
                              & SA & Simulated Annealing \\
\hline
\end{tabular}
...
\end{document}
```

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Merging cells (columns).

```
\begin{tabular}{|p{3cm}|c|c|}
\hline
\multicolumn{3}{|c|}{Heuristic Algorithms} \\
\hline
\multirow{2}{*}{Evolutionary} & ZO & Genetic Algorithm\\
                              & SA & Simulated Annealing \\
\hline
\end{tabular}
```

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```
\begin{table}[!t]
\begin{tabular}{|p{3cm}|c|c|}
\hline
\multicolumn{3}{|c|}{Heuristic Algorithms} \\
\hline
\multirow{2}{*}{Evolutionary} & ZO & Genetic Algorithm\\
                              & SA & Simulated Annealing \\
\hline
\end{tabular}
\caption{Table of some Heuristic Algorithms.}
\end{table}
```

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How can we reference tables in the document?

```
\begin{table}[!t]
\begin{tabular}{|p{3cm}|c|c|}
\hline
\multicolumn{3}{|c|}{Heuristic Algorithms} \\
\hline
\multirow{2}{*}{Evolutionary} & ZO & Genetic Algorithm\\
                              & SA & Simulated Annealing \\
\hline
\end{tabular}
\caption{Table of some Heuristic Algorithms.}
\label{tab:table}
\end{table}
Please check Table~\ref{tab:table}.
```

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Can I divide my document by sections? Of course

```
\section{Introduction}
...
\section{State-of-the-Art}
\subsection{Biology Concepts}
...
\subsection{Image Processing}
...
\subsection{Pattern Recognition}
...
```

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References can be used anywhere.

```
\section{Introduction}
\label{sec:intro}
...
\section{State-of-the-Art}
\label{sec:soa}
\subsection{Biology Concepts}
\label{sec:bio}
...
\subsection{Image Processing}
\label{sec:ip}
...
\subsection{Pattern Recognition}
\label{sec:pr}
...

Further image processing details can be found in Section~\ref{sec:ip}.
```

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Document can also be divided in parts, chapters and so on.

```
\documentclass[twoside,a4paper,10pt]{book}
...
\begin{document}
\part{Basic Concepts: Part I}
\chapter{Beginning}
\section{How does it starts?}

\part{Basic Concepts: Part II}
\end{document}
```

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Title, authors..

```
\documentclass[twoside,a4paper,10pt]{book}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\usepackage{multirow}

\title{Book Sample}
\begin{document}
\tableofcontents % simple, isn't it?

\part{Basic Concepts: Part I}
\chapter{Beginning}
\section{How does it starts?}

\part{Basic Concepts: Part II}
\end{document}
```

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maketitle after the \begin{document}

```
\documentclass[twoside,a4paper,10pt]{book}
% preamble
\usepackage[utf8]{inputenc} % general input encondings
\usepackage{graphicx}
\usepackage{multirow}

\title{Book Sample}
\begin{document}
\maketitle % tells latex to put title here!
\tableofcontents % simple, isn't it?

\part{Basic Concepts: Part I}
\chapter{Beginning}
\section{How does it starts?}

\part{Basic Concepts: Part II}
\end{document}
```

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author and date

```
\title{Book Sample}
\author{X and Y}
\date{16/03/2013}
\begin{document}
\maketitle
\tableofcontents % simple, isn't it?
```

It is also possible to specify current date through command `\date{\today}`

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Mathematical Formulas

```
\begin{equation}
e = mc^2
\label{eq:massenergy}
\end{equation}
Mass Energy Einstein equivalence formula (Eq.~\ref{eq:massenergy}).
```

- equation environment;
- $\wedge$ is for superscript text.

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Mathematical Formulas (summations):

```
\begin{equation}
1/N \sum_{i=1}^N x_i
\end{equation}
```

- _ is for subscript;
- / can be substituted by `\frac{1}{N}` (output result will be different, $\frac{1}{N}$).

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Symbols:

```
\alpha   \theta       \tau
\beta    \vartheta    \pi
\gamma   \gamma       \varpi
```

You do not need know them by heart. Check
`http://www.tex.ac.uk/tex-archive/info/symbols/comprehensive/symbols-a4.pdf`

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Symbols:

$$\alpha \quad \theta \quad \tau \tag{1}$$
$$\beta \quad \vartheta \quad \pi \tag{2}$$
$$\gamma \quad \gamma \quad \varpi \tag{3}$$

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Mathematical Formulas (without numbering):

```
\begin{equation*}
1/N \sum_{i=1}^N x_i
\label{eq:avg}
\end{equation*}
Average formula (Eq.~\ref{eq:avg}).
```

What you think that will happen?

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Mathematical Formulas (without numbering):

```
\begin{equation*}
1/N \sum_{i=1}^N x_i
\label{eq:avg}
\end{equation*}
Average formula (Eq.~\ref{eq:avg}).
```

What you think that will happen? The $\star$ symbol can be also applied in tables, figures, sections, ...

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Mathematical Formulas (inline):

```
$1/N \sum_{i=1}^N x_i$
```

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Mathematical Formulas (inline):

```
$1/N \sum_{i=1}^N x_i$
```

you can also put inline formulas centered in the text

```
\[
1/N \sum_{i=1}^N x_i
\]
```

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Finally, we also may need to add some bibliographic references.
Add `bibtex` to the compilation script (TeXworks already does this!).

```
pdflatex document
pdflatex document
bibtex document
pdflatex document
```

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You need to create a file for the references (named it references.bib) and the following content:

```
book{calder1979einstein,                          % key
  title={Einstein's universe},                    % title
  author={Calder, Nigel and Albert, Einstein},    % author
  year={1979},                                    % year
  publisher={Viking Press}                        % publisher
}
```

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In your LaTeX main file you should call now the bibliography file.

```
\begin{document}

\begin{equation}
e = mc^2
\label{eq:massenergy}
\end{equation}
Mass Energy Einstein equivalence formula (Eq.~\ref{eq:massenergy}).

\bibliographystyle{plain}
\bibliography{references}

\end{document}
```

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Previous gave a warning when generating the references list. Do you know why?

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Previous gave a warning when generating the references list. Do you know why?

```
\begin{document}

\begin{equation}
e = mc^2
\label{eq:massenergy}
\end{equation}
Mass Energy Einstein equivalence formula
(Eq.~\ref{eq:massenergy})~\cite{calder1979einstein}.

\bibliographystyle{plain}
\bibliography{references}

\end{document}
```

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Bibliography

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Documentation for the ubcthesis_new latex class.
2011.

Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl.
The not so short introduction to LaTeX, 2010.

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Sources of Information.

More documentation can also be found in the following references:

1. `http://www.latex-project.org/`
2. `http://www.ctan.org`
3. `http://www.texdoc.net/`

. . . and, of course . . .

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More documentation can also be found in the following references:

1. `http://www.latex-project.org/`
2. `http://www.ctan.org`
3. `http://www.texdoc.net/`

...and, of course ... `http://www.google.com`

Exercises.