PIASTA – Interkulturelles Leben und Studieren

# LaTeX for Beginners

**https://nats-www.informatik.uni-hamburg.de/view/User/LaTeXNovember**

**Instructor:**

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**Date:**

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10:00 - 14:30

# Seminar Description

**LaTeX – an Alternative to the Classical Word Processing Programs**

LaTeX is a professional word processing system that is especially often used in the sciences. But the uses of this free program are also very
diverse for students of other courses of study.

**Learning goals:**

- Get to know the structure of LaTeX documents
- Get your first practical experience with LaTeX
- Be able to understand LaTeX and continue to learn with it on your own after the seminar

**Topics:**

- The basics LaTeX (http://www.latex-project.org/) and Software (Miktex, TexnicCenter, JabRef)
- Structure of a LaTeX document
- Completion of an academic article using LaTeX

## *Materials*

Hand-out
All information can be found on https://nats-www.informatik.uni-hamburg.de/view/User/LaTeXNovember

## *Goals*

- Get to know the structure of a LaTeX document
- Get your first practical experience with LaTeX and the software
- Be able to understand LaTeX and continue to learn with it on your own after the seminar
- Be able to write a scientific article with LaTeX
- Get ideas on how larger documents can be written with LaTeX, e.g. PhD thesis, diploma thesis, etc

After the seminar you MUST exercise to be really able to use LaTeX. Sometimes might be difficult, but DO NOT GIVE UP!!!!

# Organization

### Day 1

| Time | Content |
|---|---|
| 10:00 | Organizational<br>Let us know each other |
| 11:00 | Introduction to LaTeX |
| 12:00 | Break |
| 12:30 | First steps in LaTeX: the format of a document, text formatting, etc. |
| 13:00 | DO IT YOURSELF: Exercises |
| 14:00 | Discussions, Questions and Feedback |

**Day 2**

| Time | Contents |
|------|----------|
| 10:00 | Organizational |
| 10:30 | LaTeX: Figures, Tables |
| 11:00 | DO IT YOURSELF: Exercises |
| 12:00 | Break |
| 12:30 | LaTeX: References, JabRef, other types of documents |
| 13:00 | DO IT YOURSELF: Exercises |
| 14:00 | Discussions, Questions and Feedback |

## *What is an article? Elements of an article*



Among the elements of an article, there are the following: title, author, affiliation, (keywords), abstract, sections and subsections (Introduction, Methodology, Evaluation, Results, Data, Conclusions), References.

An article may contain text, pictures, tables, formulas etc.

## *What is LaTeX. History*

Donald E Knuth – The "Father" of TEX
- Born on January, the 10th 1938 in Milwaukee, Wisconsin
- Professor Emeritus of Computer Science at Stanford University
- since 1962: his masterpiece „The Art of Computer Programming"
- Knuth hat für 10 (!) Jahre die Arbeit an seinem Lebenswerk unterbrochen um TEX-System zu entwickeln.
- TEX ready on May, 21st 1986
- The name TEX is an abbreviation of a Greek word, which means art.

Leslie Lamport – The "Father" of LaTeX
- LaTe appeared in 1984 to ease the work with TEX
- Pronunciation: [latech], [latek], [lähtech] **NOT LATEX!!!!!!**

1. TeX is a typesetting system, not a WYSIWYG system
2. Creating documents with TeX is easy to learn, but to learn how to program TeX is more difficult
3. TeX operates differently, when comparing to other word processing systems
4. TeX is often used for mathematical texts
5. TeX is ideal for scientific documents (eg articles, thesis, dissertation, etc), but TeX can also be used for other documents (curriculum vitae, presentations, POSTERS, etc.)
6. TeX supports more than 50 languages in almost all the writing systems of the world
7. LaTeX is a part of TeX

## *Comparison with Word*

- Tex documents are portable
- TeX is available everywhere; TEX is freely available and costs nothing.
- The typographical quality of the output is very good
- Tex is multilingual
- TeX is extensible and there are large collections of such extensions
- TeX provides structural markup, TeX is a formatting program (a typesetting system)
- Tex is freely available
- Platform independent (all operation systems: Windows, Linux, MAC)

| Characteristics | LaTeX | Word |
|---|---|---|
| Short Documents | - | ++ |
| Longer Documents | ++ | - |
| Ease of use | - | ++ |
| Layout Quality | ++ | + |
| Mathematical formulas | ++ | - |
| Formatting | ++ | - |
| Price, Availability | ++ | - |
| Compatibility | + | - |

Office-Programs: WYSIWY**G** („What You See Is What You **Get**")
LaTeX: WYSIWY**M** („What You See Is What You **Mean**")

## *The Working Principle of TeX*

Step I: You edit the document with an editor
Step II: Then arrange for the formatting of the document
Step III: You can display the result on the screen or print it.
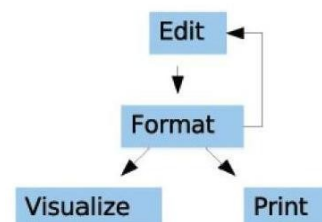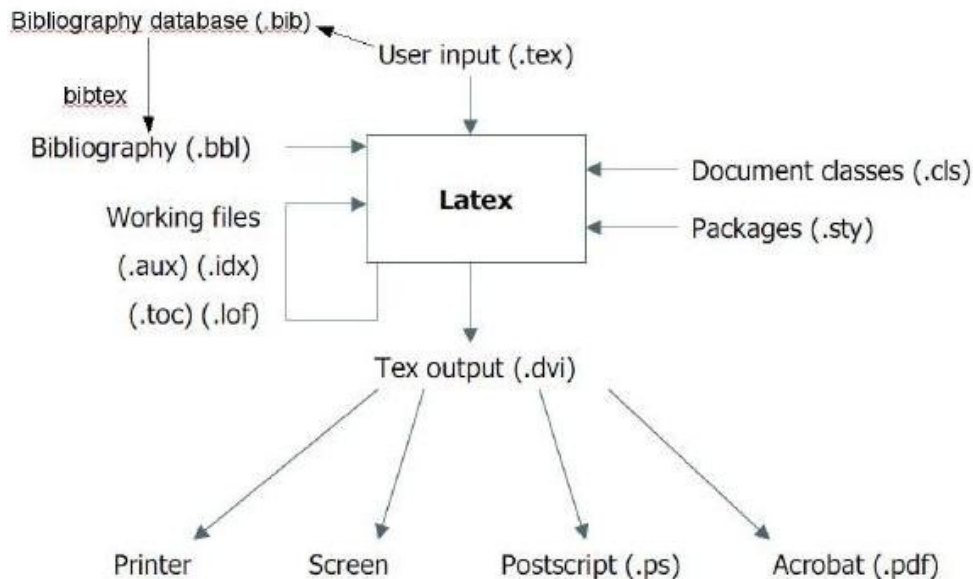
Tools:
- The Editor: TexnicCenter
- The Formatter: Miktex (the program that does the formatting)
- The Preview: Acrobat Reader (for PDF Files)
- The Print Driver: Program for the output of your printer
- The Reference Manager: JabRef

The appearance is controlled by the **sty** files (style files). The text is in the **tex** file. The bibliography is in the database file (if you work with BibTeX) – the **bib** file.

Main applications:
- latex – Tool for formatting the document and generating a device independent file (DVI file)
- pdflatex - Such as latex, but with a PDF file as output
- makeindex - Creates keyword lists
- bibtex - Creates the bibliography from the **bib** database

## Software
- UNIX / LINUX: Kile, emacs+auctex (frontend), usually as engine - teTeX
- Windows: MikTeX,proTeXt, Personal TeX, BaKoMa, TeXlive (engine), TeXnic Center, WinEDT (frontend).
- MAC OS: gwTeX, teTeX, CMacTeX, MacTex, OzTeX, Textures (engine), TexShop, TexMaker, Aquamacs, AlphaX (frontend)
- Other Programs: JabRef, LeD, WinShell etc.
- WYSIWYG tools: Lyx. MAC OS: also Textres, TeXniscope

We use:
MikTeX
TexnicCenter
JabRef

Connection between MikTeX and TexnicCenter: PATH-TO-PROGRAM/MikTeX.../bin/miktex

## *The Structure of a Document*

## Document class

<div align="center">

**\documentclass[ARGUMENTS]{CLASS}**

</div>

Classes:
article – short Texts
report – For longer articles, a titlelevel more, than  for *article*
book – Books
letter – Letters
slides – Sliedes
etc.

We will use the class *article*.
This class contains several optional arguments, such as: a4paper (for 297 × 210mm), otherwise it is default set the letterpaper (für 279.4 × 215.9mm)
Other arguments:

- Standard font sizes: 10pt , 11pt oder 12pt
- titlepage , notitlepage : Title of a page of its own, or not
- oneside , twoside :  Choice between a single or double-sided layout. Margins have different sizes (for double-sided symmetrical considering the bond). There is a distinction between left and right headers and footers.

## Example: \documentclass[a4paper, 12pt,oneside]{article}

## Commands

Example: \documentclass{article}
Format:
1. \ – Backslash shows LaTeX that a command is starting. ALWAYS
2. documentclass – Name of the command
3. {article} – extra parameter between "{", "}' (Curly Brackets)
Further parameter need further "{", "}". It is also possible that no parameter is needed.

<div align="center">

**\NAME_COMMAND[optional Arguments]{Parameter}**

</div>

## Environments

Environments are special commands, which contain a larger domain. They contain text and / or further commands or environments
**Example**
\begin{document}
The text of the document
\end{document}

<div align="center">

**\begin{NAME_ENVIRONMENT}**
**......**
**\end{NAME_ENVIRONMENT}**

</div>

## (Extra) Packages

LATEX is modular. There are many different basic functions. To expand the possibilities packages should be used. There are packages for many different tasks, for example, in order to load graphics or to set the encoding used. Packages are loaded in the so-called preamble, i.e. between \ documentclass {...} and \begin {document}.
To insert a package, the following command is used:

<div align="center">

**\usepackage[Options of the package]{Name of the package}**

</div>

Several packages can be loaded with only one command if no options must be specified. In this case the package names are separated by commas:

**\usepackage{Name1, Name2}**

**ATTENTION:** In our seminar we will not have access to all packages. You can add them at home, having an INTERNET connection.

## Example

*%Preamble*
*\documentclass{article}*

*\usepackage{babel}*

*%Front matter*
*\title{Test document}*
*\author{Name Surname}*

*\begin{document}*
*\maketitle*

*%Body*

*\begin{abstract}*
 *Here is the abstract*
*\end{abstract}*

*\section{Test 1}*
 *....*

*%Back matter*
*\bibliography{BIB_FILE}*
*\bibliographystyle{NAME}*
*\end{document}*

## *For German*

\ usepackage[german]{babel} or usepackage[ngerman]{babel} – activates the German syllable separation

\usepackage[latin1]{inputenc} – Allows the use of "Umlaute": ü, ö, ä, etc.

## *Some Rules*

It does not matter if you separate the words by one, two or more spaces. In the output the correct space is used. Paragraphs are separated by blank lines. Again, the number of line breaks is not important.
 The line break is calculated only by LaTeX. How the text in the editor is arranged it does not matter.
 "%" character used for a comment. Everything after this sign (in a row) is omitted.
LaTeX is case-sensitive. For example, the following commands: \ Textit and \ textit are different.

## Line Breaks

**Attention at spaces and breaks in LaTeX!!!!**

**\par** indicates a paragraph (you can use it instead of adding a blank line).
 **\newline** causes a line break without starting a new paragraph and that without the line is set flush on both sides.
 **\\** has the same effect. If necessary. determines the size of the distance between two lines (\ \ [2ex]).

**\linebreak** – almost the same, the line is set flush.
**\nolinebreak** prevents the line break.
Empty line – new paragraph


## Page Breaks

**\samepage** or as environment:  \begin{samepage} and \end{samepage} – a paragraph or a text part does not break between pages.
**\pagebreak** – page break, where the lower edge is held constant.
**\nopagebreak** prevents the page break.
**\newpage** – new page without compensating the bottom.


## *Commands for the Title-Page*

**\title{Title}**  Here, the title information is defined.
**\date{Date}**  It is responsible for specifying the date of publication. With the command \ today you can output the current date. When no date is needed, use \date{}
**\author{Author}**  The command is self-explanatory. For several authors, the names separated by \and
**\maketitle** At the point where this command is used, all the title page commands are shown.

## *Sectioning Commands*

<div align="center">

**\Level[Short form]{Title}**
</div>

For the structure level there are available the following commands:
* **\part**
* **\chapter**
* **\section**
* **\subsection**
* **\subsubsection**
* **\paragraph**
* **\subparagraph**

The meaning of the commands is clear from its name. The use of some of these commands is dependent on the document class used.

## *Other Commands & Symbls*

Contents: **\tableofcontents**
List of Figures / Tables: **\listoffigures** and **\listoftables**

| | |
|---|---|
| \ | \textbackslash |
| %, #, &, $, {, }, _ | \SIGN |
| ^ | \textasciicircum |
| ~ | \textasciitilde |
| \| | \textbar |
| < | \textless |
| > | \textgreater |

## *Abstract*

It is an environment:

<div align="center">

**\begin{abstract}**
**TEXT ABSTRACT**
**\end{abstract}**

</div>

## *Formatting*

**\textup** : Upright shape.
**\textit** : Italic shape
**\textsl** : Slanted shape.
**\textsc** : Small caps shape.
**\textmd** : Medium series.
 **\textbf** : Boldface series
**\textrm** : Roman family.
**\textsf** : Sans serif family.
**\texttt** : Typewriter family.
There is also the command **\emph**, which sets the text as italics, if around there is 'normal' text, and the other way round.

**\tiny** : tiny
**\footnotesize** : the size of footnotes
**\small :** small
**\normalsize** : normal
**\large** : large
**\Large** : larger
**\LARGE** : even larger
**\huge** : huge
**\Huge** : huger

Font faces are activated by loading the specific package, e.g.:
 lmodern – Latin Modern
 times – Times
 helvet – Helvetica
 bookman – Bookman
 iwona – Iwona
 palatino – Palatino

You can have as result, exactly what you write in the ditor, if you use the environment **verbatim**:
**\begin{verbatim}**
**....**
**\end{verbatim}**

Positioning:
You can use the environments **flushleft**, **center** and **flushright**, for left, center and right, respectively.

**Page layout:** http://en.wikibooks.org/wiki/LaTeX/Page_Layout

**Windows and Orphans:**

In professional books, it's not desirable to have single lines at the beginning or end of a page. In typesetting such situations are called 'widows' and 'orphans'. Normally it is possible that widows and orphans appear in LaTeX documents. You can try to deal with them using manual page formatting, but there's also an automatic solution. LaTeX has a parameter for 'penalty' for widows and orphans ('club lines' in LaTeX terminology). With the greater penalty LaTeX will try more to avoid widows and orphans. You can try to increase these penalties by putting following commands in your document preamble:

\widowpenalty=300
\clubpenalty=300

## *Footnotes / Endnotes*

**\footnote{Footnote Text }**
**\endnote{Text}**

## *Lists*

Lists are environments
Basic forms:
1. Enumeration – **enumerate**
2. List with bullets – **itemize**
3. Concept explanation, definition – **description**
Each point / item in a list is marked with \*item*. For **description** you have to use the form:
\*item[NAME: ] Explanation / Definition*

**Example:**
\begin{enumerate}
\item Tomatoes
\item Apples
\end{enumerate}

\begin{description}
\item[Term] Explanation
\end{description}

# *Float Elements: Figures and Tables*

Float elements are elements that can be / are moved.

## Tables

Example:
\begin{table}[htbp]
\centering
\begin{tabular}{|l|l|l|}
\hline
Column 1 & Column 2 & Column 3\\
\hline
1 & Value 1 & Value 2\\
2& Value 3 & Value 4\\
\hline
\end{tabular}
\caption{NAME}
\label{tab: Name}
\end{table}

Position:
h=hier
t= Top
b=Bottom
p=Page (new page)
You can use "!" to allocate more space for a specific item, e.g. \begin{table}{!t}

Several columns: \multicolumn{number}{Position}{Text}, Package needed: multicol

## Figures

When you use pdflatex, you should use JPG figures (photos). You will need the package graphicx:
**\usepackage{graphicx}**
Add it in the preamble.
To add figures, it will be better if you save the pictures locally in a folder, where you write your text.

\begin{figure}[htbp]
\centering
\includegraphics[ARGUMENTE]{Path/NAME.jpg}
\caption{NAME}
\label{fig:Name}
\end{figure}

ARGUMENTS: width=\textwidth orscale=1.5 or height=2cm or angle=-90 etc.
**Pictures:**

|  | TeX and dvisps | pdfLaTeX |
|---|---|---|
| Best format | eps | pdf |
| Other formats | ps | jpg / jpeg, png, mps (metapost) |

More information about floats and how to arrange them: http://people.cs.uu.nl/piet/floats/node1.html

## *Cross-References, Links*

You can make references to elements that are associated with **\label{LABEL_NAME}**. You use the command: **\ref{LABEL_NAME}**. You can make references to  tables, images, chapters, sections, etc.

You can create links with **\url{LINK}**. You will need the package url (**\usepackage{url}**).

## *References / Bibliography*

**\bibligraphy{NAME_FILE}**
**\bibliographystyle{NAME}**

Possible styles: apa (together with the package natbib), alpha, abbrv, plain, acm, apalike, usw.
Differences appear in the order (could be alphabetically or as cited in the text) and in the way the citation is done (number, author+year, etc.). More on natbib: http://merkel.zoneo.net/Latex/natbib.php
Example:
Plain:
[1] Name Surname. Title. In Proceedings ...., pages 34--45, 2010.
Apalike:
[Surname, 2009] Surname, N. (2009). Title2. In Proceedings ...., pages 30--41.

You should compile the BIB file. Afterwards you should compile the TEX file 2-3 times to have the connections between the two files (the citations and the data cited).

You can cite using the command: **\cite{LABEL}**

The entries in the BIB File are of this form:
**@REFRENCE_TYPE{LABEL,**
**FIELD1={VALUE},**
**FIELD2={VALUE},**
**...**
**}**
Example:
@Inproceedings{name09,
    author = {Name Surname},
    title  ={Title2},
    year = {2009},
    pages = {30-41},
    booktitle = {Proceedings ....}
}
\cite{name09}

In order to generate the BIB File, we use JabRef.

**Übersicht**                                                                 [Bearbeiten]

| Referenzart | notwendige Felder | optionale Felder |
|---|---|---|
| article | author, title, journal, year | volume, number, pages, month, note |
| book | author or editor, title, publisher, year | volume or number, series, address, edition, month, note, isbn |
| booklet | title | author, howpublished, address, month, year, note |
| conference | author, title, booktitle, year | editor, volume or number, series, pages, address, month, organization, publisher, note |
| inbook | author or editor, title, chapter and/or pages, publisher, year | volume or number, series, type, address, edition, month, note |
| incollection | author, title, booktitle, publisher, year | editor, volume or number, series, type, chapter, pages, address, edition, month, note |
| inproceedings | author, title, booktitle, year | editor, volume or number, series, pages, address, month, organization, publisher, note |
| manual | title | author, organization, address, edition, month, year, note |
| mastersthesis | author, title, school, year | type, address, month, note |
| misc | - | author, title, howpublished, month, year, note |
| phdthesis | author, title, school, year | type, address, month, note |
| proceedings | title, year | editor, volume or number, series, address, month, organization, publisher, note |
| techreport | author, title, institution, year | type, number, address, month, note |
| unpublished | author, title, note | month, year |

Use a Reference-Manager program, such as: JabRef, EndNote, Zotero, etc. A comparison between such software you can find on http://en.wikipedia.org/wiki/Comparison_of_reference_management_software. Check which are the export / import functionalities in the software you use. For LaTeX we need a BIBTEX format.

Advantages of reference manager software: all in one place, search functions, extra information attached, etc.

# *Formulas*

Mathematical environments:
Packages maybe needed: \usepackage{amssymb,amsmath}

Entering and leaving math mode in LATEX is normally done with the following commands and environments.
inline and outline formulas displayed equations
$ . . . $

\( . . . \)
\[...\] unnumbered

\begin{equation*}
. . .
\end{equation*}
*Unnumbered*

\begin{equation}
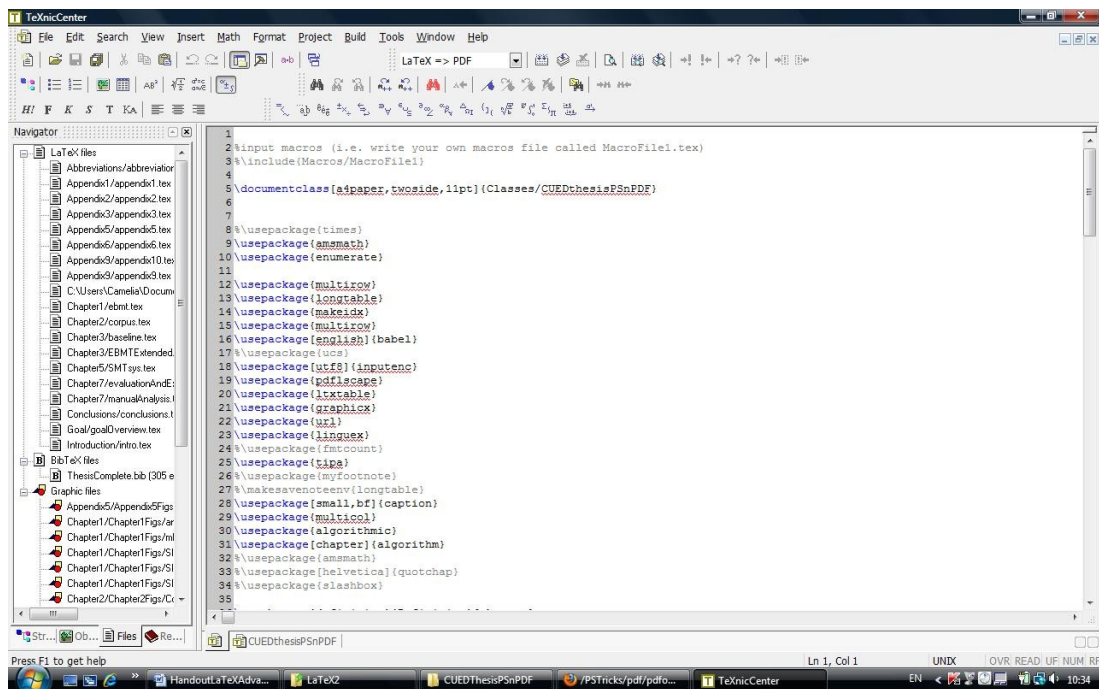. . .
\end{equation}
*Automatically numbered*

Spaces in formulas:
\, small space
 \: medium space
\; large space
 \! negative space

# *LaTeX and Long Documents*

## **Working with Projects**

Advantages: All in one ☺. See pictures

## References / Bibliography

Books:

- **"Der Latex Wegweiser", Christiane Detig, Internat. Thomson Publ., 1997, ISBN 3-8266-0256-0 (German) – *used for this Hand-out***
- "Der Latex-Begleiter", Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, 2. Auflage, ISBN 3-8273-7166-X (German)
- "Latex, A Document Preparation System", Leslie Lamport, 2nd edition, ISBN 0-201-52983-1
- "The Latex Companion", Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, Chris Rowley, 2nd edition, Addison Wesley, 2004, ISBN 0-201-36299-6
- "Guide to Latex", Helmut Kopka, Patrick W. Daly, 4th edition, Addison Wesley, 2003 ISBN 0321173856
- "The Texbook", Donald Knuth, Addison Wesley, 1994, ISBN 0201134489

Slides:

- **LATEX-Workshop – Dissertationen mit LATEX, von Joanna Ludmiła Rycko Hermann Schwarz, HU Berlin, CMS,  Arbeitsgruppe Elektronisches Publizieren, 9. Oktober 2006 – *used for this Hand-out***

Collection of links:

- Andrew Roberts' Guide (http://www.andy-roberts.net/misc/index.html) Sehr gut!
- http://en.wikibooks.org/wiki/LaTeX
- A Latex Encyclopedia (http://tex.loria.fr/)
- Latex Wikipedia (http://en.wikipedia.org/wiki/LaTeX)
- Installing Latex (http://www.stat.pitt.edu/stoffer/freetex.html)
- Some examples (http://www.math.duke.edu/computing/tex/templates.html)
- Latex: from beginner to Texpert (http://generaldisarray.wordpress.com/2006/04/20/latex-from-beginner-to-texpert/)
- Latex Tutorial (http://www.artofproblemsolving.com/LaTeX/AoPS_L_GuideLay.php)
- Software (http://ctan.tug.org/)
- Help: Tex User's Group (http://www.tug.org/)
- LaTeX - tutorials (http://theoval.sys.uea.ac.uk/~nlct/latex/)
- LaTex on Windows (http://www.pinteric.com/miktex.html)
- Word vs. LaTeX (http://openwetware.org/wiki/Word_vs._LaTeX)
- LaTeX for Logicians (http://www.phil.cam.ac.uk/teaching_staff/Smith/LaTeX/)
- Jabref (http://jabref.sourceforge.net/) - open source bibliography reference manager
- LaTeX Resources (http://www.tug.org/interest.html)
- LaTeX Editors (http://www.itsfd.de/texwin/)
- Other editors (http://www.latex-community.org/viewtopic.php?f=28&t=208)
- Miktex (http://miktex.org/), Texnic Center (http://www.toolscenter.org/)
- The comprehensive TEX archive network: www.ctan.org
- BibTeX (http://www.bibtex.org/)
  - o Materials in German / for German: DANTE - Deutsch (http://www.dante.de/)
  - o DANTE - FAQ (http://www.dante.de/faq/de-tex-faq/html/de-tex-faq.html)
  - o LaTeX - Deutsch (http://www.abyter.de/latex.htm)
  - o Kochbuch für LaTeX (http://www.uni-giessen.de/hrz/tex/cookbook/cookbook.html)
  - o Wissenschaftlich publizieren mit LaTeX (http://freenet-homepage.de/vkiefel/latex.html)

Convert Latex  Latex2rtf  (http://www.ctan.org/tex-archive/support/latex2rtf/)
  - o LaTeX Convertors (ftp://ftp.tu-chemnitz.de/pub/tex/help/wp-conv/pc2txtbl.html)
  - o Winshell Convert DOC in TEX. To make this transformation one can export a file form Open Office - tested under Linux (http://www.winshell.org/modules/w2ltx_download/)
  - o FAQ - List of converters and more.... (http://www.dante.de/faq/de-tex-faq/txt/faq.11.txt)
  - o www.texify.com – Write LaTeX Formulas for Web
  - o XLS to LaTeX: http://cobweb.ecn.purdue.edu/ zhang97/xls2latex/, Excel2LaTeX 3.0

Tools / Commands:
  - o jpeg2ps / dvips / ps2pdf / (latex, pdflatex, bibtex)