

L^AT_EX: from dummy to T_EXnician

Create articles, presentations, posters

David Saykin & Anton Lioznov

Skoltech

ISP 2019,
lesson 2

What we will know?

Document Creation

Presentation Creation

Acknowledgments

We acknowledge

Vlad Yurchenko for being co-author of the first version of this presentation in 2015

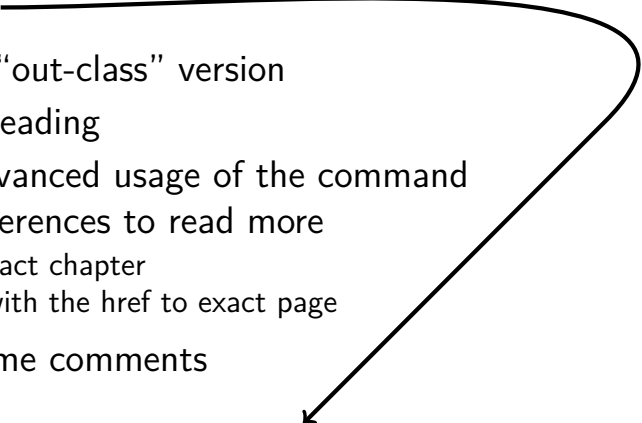
Dmitry Barashev for useful comments, that was included in the presentation

Alexander Kulikov for useful comments, that was included in the presentation

Agreements

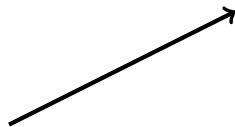
I

Footnotes

- ▶ Only in the “out-class” version
 - ▶ For second reading
 - ▶ Containe advanced usage of the command
 - ▶ Containe references to read more
 - ▶ to the exact chapter
 - ▶ (often) with the href to exact page
 - ▶ Containe some comments
- 



Addition information – “magic”



- ▶ To have the full picture
- ▶ Not to analyze or to puzzle out in class

What we will know?

Document Creation

Presentation Creation

What we will know?

Document Creation

- Structural elements

- References

- Useful commands

What document consists of?

- ▶ Title
- ▶ Authors
- ▶ Table of contents
- ▶ Table of figures
- ▶ Table of tables
- ▶ Sections, subsections,...

Title

title

My beautiful title

November 28, 2018

```
\title{My beautiful title}  
\begin{document}  
\maketitle{}  
\end{document}
```

- ▶ `\title` before begin of the document
- ▶ `\maketitle` after begin of the document

Title

date

My beautiful title

```
\title{My beautiful title}  
\date{This text supposed to be a date  
    ...\\ \today}  
\begin{document}  
\maketitle{}  
\end{document}
```

This text supposed to be a date...
November 28, 2018

- ▶ by default \LaTeX think you use `\date{\today}`
 - ▶ `\today` is the date of last document compilation
- ▶ you can put anything inside `\date{}` command
- ▶ use `\date{}` without arguments to remove the string

Title

authors

```
\title{My beautiful title}  
\date{This text supposed to be a date  
...\\ \today}  
\author{Vasia\thanks{Skoltech} \and  
Mandrid\thanks{we acknowledge the  
cats, our lords!}}  
\begin{document}  
\maketitle{}  
\end{document}
```

My beautiful title

Vasia^{*} Mandrid[†]

This text supposed to be a date...
November 28, 2018

- ▶ `\author` for put the author
- ▶ `\and` (can be) used to concatenate several authors
 - ▶ You always can use just plain text
- ▶ `\thanks` for a footnote

^{*}Skoltech

[†]we acknowledge the cats, our lords!

Abstract

```
\begin{abstract}  
  Hello  
\end{abstract}
```

Abstract

Hello

Structure

```
\begin{document}
\part{'part'} text \par
% \chapter{'chapter'} text \par
\section{'section'} text \par
\subsection{'subsection'} text \par
\subsubsection{'subsubsection'}
    text \par
\paragraph{'paragraph'} text \par
\subparagraph{'subparagraph'} text \par
\end{document}
```

Part I

”part”

text

1 ”section”

text

1.1 ”subsection”

text

1.1.1 ”subsubsection”

text

”paragraph” text

”subparagraph” text

Structure

Tips

- ▶ Use `\<command>*` (with `*`) to omit the numbering
- ▶ The structure (and titles) is not pre-build into \LaTeX : they are defined inside class files \Rightarrow not all classes contains all commands

Table of content

```
\tableofcontents
\newpage % for new page
\part{'part'} text \par
\chapter{'chapter'} text \par
\section{'section'} text \par
\subsection{'subsection'} text \par
\subsubsection{'subsubsection'}
    text \par
\paragraph{'paragraph'} text \par
\subparagraph{'subparagraph'} text \par
```

Contents

I	"part"	2
1	"chapter"	4
1.1	"section"	4
1.1.1	"subsection"	5

`\tableofcontents` for create it, `\newpage` for new page.
Notice that not all structure elements are mentioned it ToC!



- ▶ `\listoffigures` for figures
- ▶ `\listoftables` for tables

lv: IV.8.1, man: 25.1

You can use `\caption[short name]{long name}` to put short name to the lists, `\listfigurename` and `\listtablename` — the names of the Lists.

What we will know?

Document Creation

Structural elements

References

Useful commands

How good it will be if...

38 Nice section

$$y = \frac{x+1}{b} \quad (3)$$

7

How good it will be if...we could write like this

38 Nice section

$$y = \frac{x + 1}{b} \quad (3)$$

We have a nice equation (3) on page 7 inside the section 38.

7

How good it will be if...we could write like this

We can!

Step 1: `\label`

```
\section{Nice section \label{sec:nice}}  
\begin{equation}  
    y=\frac{x+1}{b} \label{niceeq}  
\end{equation}
```

Step 2: `\ref` and `\pageref`

We have a nice equation (`\ref{niceeq}`) on page
`\pageref{niceeq}` inside the section `\ref{sec:nice}`.

Problem 1: lots of labels!

What if you have a lot of labels? Look throw whole document and compare T_EX and pdf?

```
\usepackage{showlabels}
\section{Nice section \
      label{sec:nice}}
\begin{equation}
  y=\frac{x+1}{b} \ \
      label{niceeq}
\end{equation}
```

38 Nice section {sec:nice}

$$y = \frac{x+1}{b} \quad (3) \quad \text{\texttt{niceeq}}$$

We have a nice equation (3) on page 7
inside the section 38.

7

Problem 2: Typos

```
\section{Nice section \
  label{sec:nice}}
\begin{equation}
  y=\frac{x+1}{b} \
  label{niceEq}
\end{equation}
```

We have a nice equation
(\ref{niceeq}) on page
\pageref{niceeq}
inside the section \
ref{sec:nice}.

38 Nice section

$$y = \frac{x+1}{b} \quad (3)$$

We have a nice equation (??) on page ??
inside the section 38.

7

Bibliography

How to cite

Use `\cite{label}`

As it was written in
Landau `\cite{landau}`
}...

As it was written in Landau [1]...

`\bibliographystyle{plain}`
`}`
`\bibliography{cites}`

As it was written in Landau [1]...

References

- [1] L. D. Landau and E. M. Lifshitz. *The Classical Theory of Fields*. Butterworth-Heinemann, 4 edition, January 1980.

Bibliography

What to cite

.bib files

```
@Book{landau,  
  author = {Landau, L. D. and Lifshitz, E. M.},  
  title = {The Classical Theory of Fields},  
  journal = N,  
  volume = {1},  
  pages = {140},  
  year = 1980  
}
```

You can have multiple records in one .bib file.

Bibliography. Where can you get .bib files?

- ▶ Just google it! “article_name bibtex”
- ▶ Go to you favorite journal and look at Citations -> “.bib” or “bibtex”
- ▶ Ask Mendeley or other programs to give you the .bib file
- ▶ Create it by yourself

Bibliography. Creating .bib file



@article	Journal or magazine article
@book	Book
@conference	Article in conference proceedings
@misc	If nothing else fits.



Bibliography. Creating .bib file



author
title
journal
year
pages
volume
...

Bibliography. Offline

Running \LaTeX offline, you can get **(??)** in `\ref` and **[?]** in `\cite`.
For

- ▶ References
- ▶ Bibliography
- ▶ Table of content
- ▶ Indexing
- ▶ ...

\LaTeX collect addition data in extra files. \LaTeX need more then one run to get this data.

Use `latex; bibtex; latex; latex`



You can add Bibliography manually.

This work is based on `\cite{latexdps}`.

Together they are `\cite{latexdps, texbook}`.

```
\begin{thebibliography}{9}
\bibitem{latexdps}
Leslie Lamport.
\textit{\LaTeX{}: a document
preparation system}.
Addison-Wesley, Reading,
Massachusetts, 1993.
\bibitem{texbook}
Donald Ervin Knuth.
\textit{The \TeX book}.
Addison-Wesley, Reading,
Massachusetts, 1983.
\end{thebibliography}
```

This work is based on [1]. Together they are [1, 2].

References

- [1] Leslie Lamport. *L^AT_EX: a document preparation system*. Addison-Wesley, Reading, Massachusetts, 1993.
- [2] Donald Ervin Knuth. *The T_EXbook*. Addison-Wesley, Reading, Massachusetts, 1983.



You can change styles.

Manually – check

https://en.wikibooks.org/wiki/LaTeX/Bibliography_Management

Or with packages – check <https://tex.stackexchange.com/questions/25701/bibtex-vs-biber-and-biblatex-vs-natbib>



```
\usepackage{makeidx} \makeindex
\begin{document}
Recall 'Wilsons Theorem: \index{
    'Wilsons Theorem}
a number \(\ n>1\) is prime if and
    only if the factorial of \(\ n-1
    \)
is congruent to \(\ -1\) modulo~\(\ n
    \).

\printindex
\end{document}
```

Recall Wilson's Theorem: a number $n > 1$ is prime if and only if the factorial of $n - 1$ is congruent to -1 modulo n .

Index

Wilson's Theorem,
1

What we will know?

Document Creation

Structural elements

References

Useful commands



Hello. How¹ are you²?

```
Hello. How\footnote{And where?} are  
you\footnote{yes, you}?
```

¹And where?
²yes, you

Horizontal alignment



```
AA BB VV GG
\begin{flushright}
AA BB VV GG
\end{flushright}
{\raggedleft AA BB VV GG\par}
```

AA BB VV GG

AA BB VV GG

AA BB VV GG

```
\begin{center}
AA BB VV GG
\end{center}
{\centering AA BB VV GG\par}
\centerline{AA BB VV GG}
```

AA BB VV GG

AA BB VV GG

AA BB VV GG

```
\begin{flushleft}
AA BB VV GG
\end{flushleft}
{\raggedright AA BB VV GG \par}
```

AA BB VV GG

AA BB VV GG



`\newpage \pagebreak`



```
As Vladimir Lenin said,  
\begin{quote}  
    The main problem of quotes on  
        the Internet is that people  
        immediately believe in their  
        authenticity.  
\end{quote}  
(1614 year)
```

As Vladimir Lenin said,

The main problem of quotes on the Internet is that people immediately believe in their authenticity.

(1614 year)



```
\begin{verse}  
\obeylines  
There was a young fellow named Hall  
Who fell in the spring in the fall.  
'Twould have been a sad thing  
Had he died in the spring,  
But he 'didnt - he died in the fall.  
\end{verse}
```

There was a young fellow named
Hall
Who fell in the spring in the fall.
'Twould have been a sad thing
Had he died in the spring,
But he didn't – he died in the fall.

Marginal notes



```
\noindent Hello, guys!\par
\noindent Sometimes you need to put a
      node -- ``Marginal'' \marginpar
{!!!!} --- and \LaTeX\ has a
simple way to do it
```

Hello, guys!

Sometimes you need to put
a node – “Marginal” — and !!!
L^AT_EX has a simple way to
do it

What we will know?

Document Creation

Presentation Creation

Beamer

What is Beamer?

Beamer is a \LaTeX document class for creating slides for presentations.

It supports pdf \LaTeX , latex+dvips, lua \LaTeX and x \LaTeX .



Beamer

What is Beamer?

Beamer is a \LaTeX document class for creating slides for presentations.

It supports pdf \LaTeX , latex+dvips, lua \LaTeX and x \LaTeX .

<https://ctan.org/pkg/beamer>



Pros and Cons

Cons

Beamer is **not** the best choice...

- when you want to put something in **arbitrary position**
- when you want to put **a lot** on a slide

Cons

Beamer is **not** the best choice...

- when you want to put something in **arbitrary position**
- when you want to put **a lot** on a slide
- when you like **transition** effects

Pros

Beamer is what you need...

- + When you have lots of formulas
- + When you already have notes prepared in \LaTeX
- + When you carry about device-independent view and edit

Pros

Beamer is what you need...

- + When you have lots of **formulas**
- + When you **already** have notes prepared in \LaTeX
- + When you carry about **device-independent** view and edit
- + When you like **stepwise viewing**

Pros

Beamer is what you need...

- + When you have lots of formulas
- + When you already have notes prepared in \LaTeX
- + When you carry about device-independent view and edit
- + When you like overlays
- + When you like stepwise viewing

What we will know?

Presentation Creation

- Document structure

- Style: themes and colors

- Tricks: overlays, animation, notes

Simplest Beamer document

Frame title

```
\documentclass{beamer}

\begin{document}
\begin{frame}{Frame title}
  Frame content.
\end{frame}

\end{document}
```

Frame content.

Beamer document structure

```
\documentclass{beamer}
% Preamble: encoding, theme, colortheme, title, etc.
\begin{document}
\frame{\titlepage}

\section{Section name}
\subsection{Subsection name}
\begin{frame}{Summary}
    ...
\end{frame}

\appendix
\begin{frame}{References}
    ...
\end{frame}

\end{document}
```

Title page (Preamble)

```
\title[Short Title]{Title As It Is}
\subtitle{Subtitle}

\author[Anton Lioznov, David Saykin]
{A.~Lioznov\inst{1} \and D.~Saykin\
  inst{1,2}}

\institute[Skoltech]{
  \inst{1} Skolkovo Institute of
    Science and Technology
  \and
  \inst{2} Moscow Institute of
    Physics and Technology}

\date[ISP 2019]{Individual Study
  Period, 2019}
\subject{Beamer in \LaTeX}
```

Title As It Is
Subtitle

A. Lioznov¹ D. Saykin^{1,2}

¹Skolkovo Institute of Science and Technology

²Moscow Institute of Physics and Technology

Individual Study Period, 2019

TOC

```
\begin{frame}{Outline}  
  \tableofcontents  
\end{frame}
```

Outline

Introduction

- Subsection name
- Subsection name

Main part I

- Subsection name
- Subsection name
- Subsection name

Main part II

- Subsection name
- Subsection name

Summary

2 / 15

TOC (AtBeginSection[])

```
\AtBeginSection[]{\begin{frame}{Outline}\tableofcontents[currentsection]\end{frame}}
```

Outline

Introduction

Subsection name
Subsection name

Main part I

Subsection name
Subsection name
Subsection name

Main part II

Subsection name
Subsection name

Summary

6 / 15

Appendix

```
\section{\appendixname}  
\subsection{Additional materials}  
\frame{\tableofcontents}
```

Appendix Additional materials

- 1 Appendix
 - Additional materials

Navigation icons

January 9, 2019 1 / 1

Appendix

Appendix Additional materials

```
\usepackage{appendixnumberbeamer}  
  
\section{\appendixname}  
\subsection{Additional materials}  
\frame{\tableofcontents}
```

- 1 Appendix
 - Additional materials

Navigation icons

January 9, 2019 1 / 1

Bibliography (bibtex)

```
\begin{frame}[allowframebreaks]{  
  References}  
  See \cite{landau}.  
  
  \bibliographystyle{amsalpha}  
  \setbeamertemplate{bibliography  
    item}[text]  
  \bibliography{cites}  
\end{frame}
```

References I



See [LL80].

[LL80] L. D. Landau and E. M. Lifshitz, *The classical theory of fields*, 4 ed., Butterworth-Heinemann, January 1980.

Bibliography (simple)

```
\begin{frame}{References}
  \begin{thebibliography}{10}
    \beamertemplatebookbibitems
    \bibitem{Author1990}
      A.~Author.
      \newblock Handbook of
        Everything.
    \beamertemplatearticlebibitems
    \bibitem{Someone2000}
      S.~Someone.
      \newblock On this and that.
      \newblock Journal of This and
        That, 2(1):50--100,
        2000.
  \end{thebibliography}
\end{frame}
```

References

-  A. Author.
Handbook of Everything.
-  S. Someone.
On this and that.
Journal of This and That, 2(1):50–100, 2000.

Frame: Columns

```
\begin{frame}[t]{Two column frame}
  \begin{columns}[b]
    \begin{column}{0.65\textwidth}
      \lipsum[23]
    \end{column}
    \begin{column}{0.3\textwidth}
      \includegraphics[width=.9\linewidth]{../images/beamerlogo}
    \end{column}
  \end{columns}
\end{frame}
```

Two column frame

Donec et nisl id sapien blandit mattis. Aenean dictum odio sit amet risus. Morbi purus. Nulla a est sit amet purus venenatis iaculis. Vivamus viverra purus vel magna. Donec in justo sed odio malesuada dapibus. Nunc ultrices aliquam nunc. Vivamus facilisis pellentesque velit. Nulla nunc velit, vulputate dapibus, vulputate id, mattis ac, justo. Nam mattis elit dapibus purus. Quisque enim risus, congue non, elementum ut, mattis quis, sem. Quisque elit.



What we will know?

Presentation Creation

Document structure

Style: themes and colors

Tricks: overlays, animation, notes

Built-in themes

SIMPLE

```
\usetheme{CambridgeUS}
```

```
\usecolortheme{crane}
```

<https://hartwork.org/beamer-theme-matrix/>

Built-in themes

```
\usetheme{CambridgeUS}
```

```
\usecolortheme{crane}
```

```
https://hartwork.org/beamer-theme-matrix/
```

```
\usefonttheme{structureitalicserif}
```

```
http://deic.uab.es/~iblanes/beamer\_gallery/index\_by\_font.html
```

Colors

L^AT_EX provides several standart colors: red, blue, green,...

```
\textcolor{red}{text}
```


Colors

L^AT_EX provides several standart colors: red, blue, green,...

```
\textcolor{red}{text}
```

There many ways to define new colors, e. g.

```
\definecolor{orange}{rgb}{1,.5,0}
```

```
\definecolor{orange}{RGB}{255,127,0}
```

Colors

Beamer automatically loads **xcolor** package

Somehow popular way to define new colors is by the following rule

color	rgb formula	output
red!30!blue	$.3(1,0,0)+.7(0,0,1)$	example
red!30	$.3(1,0,0)+.7(1,1,1)$	example
red!30!blue!50!green	$.5(\text{red!30!blue})+.5(0,1,0)$	example

Customazation

```
\begin{block}{Block title}  
    Block body  
\end{block}
```

Customazation

Block title

Block body

Customazation

Block title

Block body

```
\setbeamercolor{block title}{bg=blue!90,fg=white}  
\setbeamercolor{block body}{bg=blue!40!,fg=black}  
\setbeamertemplate{blocks}[rounded][shadow=true]
```

Customization

Block title

Block body

```
\setbeamercolor{block title}{bg=blue!90,fg=white}  
\setbeamercolor{block body}{bg=blue!40!,fg=black}  
\setbeamertemplate{blocks}[rounded][shadow=true]
```

Block title

Block body

This presentation uses package

```
\usepackage[logo]{beamerskoltech}
```

This presentation uses package

```
\usepackage[logo]{beamerskoltech}
```

This package manages styling and allows to use commands like

```
\skfootnote{github.com/lavton/SkoltechLaTeXtemplates}
```


What we will know?

Presentation Creation

Document structure

Style: themes and colors

Tricks: overlays, animation, notes

Stepwise viewing

Command `\pause`

`\onslide` command tells to show material from the first slide.

Stepwise viewing

Command `\pause` is the simplest way to create an overlay.

`\onslide` command tells to show material from the first slide.

Stepwise viewing

Command `\pause` is the simplest way to create an overlay.

$$\zeta(s) = \sum_{k=1}^{\infty} \frac{1}{k^s}, \quad \operatorname{Re} s > 1.$$

`\onslide` command tells to show material from the first slide.

`\onslide<3->` tells to show material from the third slide on.

Stepwise viewing

Command `\pause` is the simplest way to create an overlay.

$$\zeta(s) = \sum_{k=1}^{\infty} \frac{1}{k^s}, \quad \operatorname{Re} s > 1.$$

`\onslide` command tells to show material from the first slide.

`\onslide<3->` tells to show material from the third slide on.

`\pause` command then leads to the next slide.

Stepwise viewing

Most of the commands are self-explanatory.

`\pause<#>` — following text shown only after slide #

`\onslide<#>` — visible only slide #

`\FromSlide{#}` — equivalent to `\onslide<#->`.

`\only<#>` — visible on particular slides, otherwise absent

`\uncover<#>` — visible on particular slides, otherwise transparent

`\visble<#>` — visible on particular slides, otherwise invisible

`\invisble<#>` — opposite of `\visble<#>`.

Overlays

Overlay specifications can also be written behind some commands like `\textbf`, `\item`, `\color`, `\alert`.

Overlays

Overlay specifications can also be written behind some commands like `\textbf`, `\item`, `\color`, `\alert`.

```
\begin{enumerate}
  \item<1-> Every \alert<3>{thing}
  \item<only@3,4> that has
  \item<2-> beginning
  \item<1,4> has end.
\end{enumerate}
```


Overlays

1. Every thing
4. has end.

Overlays

1. Every thing
3. beginning

Overlays

1. Every **thing**
2. that has
3. beginning

Overlays

1. Every thing
2. that has
3. beginning
4. has end.

Overlays

- ▶ Every thing

Overlays

- ▶ Every thing
- ▶ that has

Overlays

- ▶ Every thing
- ▶ that has
- ▶ beginning

Overlays

- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.



- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.



- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.



- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.



- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.



- ▶ Every thing
- ▶ that has
- ▶ beginning
- ▶ has end.

Cool, right?

Animation

```
\animate<1-4>
\begin{itemize}[<+>->]
  \item Every thing
  \item that has
  \item beginning
  \item has end.
\end{itemize}
```

Animation

```
\transduration<1-4>{.5}  
\begin{itemize}[<+>]  
  \item Every thing  
  \item that has  
  \item beginning  
  \item has end.  
\end{itemize}
```

What we have learned today?

Document Creation

- Structural elements

- References

- Useful commands

Presentation Creation



- Document structure

- Style: themes and colors



- Tricks: overlays, animation, notes

references I

color from the footnotes corresponds to references' color.

- ▶ **kn:** Knuth “The T_EXBook”
- ▶ **lv:** L'vovsky “Nabor i verstka v sisteme L^AT_EX”
- ▶ **lamport:** Lamport. “L^AT_EX. A Document Preparation System, User's Guide and Reference Manual”
- ▶ **man:** “L^AT_EX2e: An unofficial reference manual” also at website <https://latexref.xyz/>
- ▶  : <https://tex.stackexchange.com/questions>
- ▶  : <https://en.wikibooks.org/wiki/LaTeX>

references II

- ▶  : <https://www.overleaf.com/learn/latex>
- ▶  : <https://www.tug.org/utilities/plain/cseq.html>

Distribution

- ▶ the pdf-version of the presentation and all printed materials can be distributed under license Creative Commons Attribution-ShareAlike 4.0
<https://creativecommons.org/licenses/by-sa/4.0/>
- ▶ The source code of the presentation is available on <https://github.com/Lavton/latexLectures> and can be distributed under the MIT license
https://en.wikipedia.org/wiki/MIT_License#License_terms