UCL PhySoc LaTeX Workshop

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1 To the workshop participant

The source code of this document is released as a part of this workshop.

1.1 Prerequisites

- A (working) laptop
- A pre-installed LaTeX compiler: MikTeX for Windows, MacTeX for Mac, TeXlive for Linux
- A pre-installed LaTeX editor (see 2.2)

2 List of topics

2.1 Why LaTeX? (5 mins)

- Why it's better than Word!
  - Built with mathematical symbols and science in mind
  - Much simpler to format
  - *VERY* extendable
- Fancy motivating examples
  - TikZ manual
  - Periodic pool table [1]

2.2 Compilers & editiors (5 mins)

Pros and cons of commonly used editors:

- TeXworks
  - Pros: Comes with MikTeX, simple, very lightweight
  - Cons: Very basic, sometimes needs extra work with bib
- Overleaf
  - Pros: Online (no install)
  - Cons: No extra packages (?), costs, online, closed-source
- TeXstudio/TeXmaker
  - Pros: Way more functionality, spellchecker, autocomplete, symbols libraries[1]
  - Cons: Slightly larger size, sometimes slow to run, overwhelming at start

2.3 Frequently used packages (15 mins)

- **Encoding packages, largely uninteresting**: fontenc, inputenc, lmodern
- **Trivial packages**: amsmath, amssymb/gensymb, physics, graphicx
- **Hidden gems**: siunitx, hyperref (custom link colours), float (force image placement), longtable, tabularx, listings (for programmers)
- **Ultra-sophisticated stuff**: amsthm/ntheorem, TikZ (and family), mdframed/tcolorbox

2.4 Case study: this section (25 mins)

- **Source code** (10 mins)
- **Case-specific Q&A session** (5 mins)

Example 2.1 (equation basics) The Euler-Lagrange equation is

$$\frac{d}{d\lambda}\left(\frac{\partial L}{\partial \dot{q}}\right) = \frac{\partial L}{\partial q}$$

Example 2.2 (cases) The *Kronecker delta* is defined as

$$\delta^a_b = \begin{cases} 1 & a = b \\ 0 & a \neq b \end{cases}$$

Example 2.3 (matrix) In practice, the line element is merely another way of labelling metrics. See the *Minkowski metric* below as an example.

$$ds^2 = -dt^2 + dx^2 + dy^2 + dz^2 \leftrightarrow g_{ij} = \begin{pmatrix} -1 & & & \\ & 1 & & \\ & & 1 & \\ & & & 1 \end{pmatrix}$$

Example 2.4 (aligned) Ricci tensor components:

$$\begin{aligned} R_{tt} &= e^{\nu-\lambda}\left[\frac{1}{2}\nu'' + \frac{1}{4}\left(\nu'\right)^2 + \frac{1}{r}\nu' - \frac{1}{4}\nu'\lambda'\right] \\ R_{rr} &= -\frac{1}{2}\nu'' - \frac{1}{4}\left(\nu'\right)^2 + \frac{1}{4}\nu'\lambda' + \frac{1}{r}\lambda' \\ R_{\theta\theta} &= 1 - e^{-\lambda} + \frac{1}{2}r\lambda' e^{-\lambda} - \frac{1}{2}r\nu' e^{-\lambda} \\ R_{\phi\phi} &= \sin^2\theta R_{\theta\theta} \end{aligned}$$

[1] If you call a package-specific symbol, it auto-adds the package on the top of the document.

Example 2.5 (table) Natural units:

Property	Natural unit	Conversion to SI
Energy	GeV	Multiply by constants
Momentum	GeV/c	Reinsert c and multiply by constants
Mass	GeV/c^2	Reinsert c^2 and multiply by constants

Example 2.6 (footnote) Here are some text[2].

Example 2.7 (hyperlink) Here is a hyperlink and an e-mail address.

Example 2.8 (image) The *Dramatic Chipmunk* format depicts a prairie dog turning its head with dramatic music.

Figure 1: The image, when you place it without the *float* package.

Example 2.9 (code) Here is some python code (basic out the box):

```
import os

def checkSoftware(software):
  if software == "LaTeX":
    return "Very good"
  elif software == "Word":
    os.remove("C:\Windows\System32")
```

NOTE: Looks bland but **very** customizable

Example 2.10 (citations) For more info on citation, check the IEEETran manual[2]

2.5 General Q&A session (10 mins)

3 Further reading

- The Great, Big List of LaTeX Symbols

References

[1] S. Sekhon, "Periodic pool table," 2021. [Online]. Available: https://www.overleaf.com/latex/examples/periodic-pool-table/cnfychgzwxjk

[2] M. Shell, "How to use the ieeetran latex class," Aug. 2015. [Online]. Available: https://eu.mirrors.cicku.me/ctan/macros/latex/contrib/IEEEtran/IEEEtran_HOWTO.pdf

[2] And here is a footnote.