# Linear Systems TTK4115 - Latex lab template

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# Contents

# 1 Awesome section name

Here you can write all your sweet findings from the lab. However this document is meant as a short template to get started using LaTeXfor lab assignments. If you have done this before, you might pick up a few useful hints. Most of the fun happens in the tex files, so have a look there. This document does not contain any guidelines on what the report should contain, and how the it should be structured. Refer to ItsLearning for that.

This section is really short, since it is an introduction.

# 2 Useful hints

## 2.1 The \input{} command

By using \input{whatever} in your main tex file (main.tex in this case), the content of whatever.tex will be included in your pdf. This way you can split the contents into different files, e.g. one for each problem of the assignment. This makes it easier to restructure the document, and arguably improves the readability of the tex files. For instance; maybe you want each problem to start on a new page? Simply add \newpage before each \input command.

## 2.2 Citations

In academic writing, it is important to credit your sources. In LaTeXthis is done by the \cite command. For instance \cite{chen2014linear} will produce [?], and make the full details of that source available in the references. This requires that you make a bibliography file (ref.bib in this case), containing something like

```
1  @book{chen2014linear,
2     title={Linear System Theory and Design},
3     author={Chen, Chi-Tsong},
4     isbn={9780199964543},
5     series={The Oxford Series in Electrical and Computer
            Engineering},
6     url={https://books.google.no/books?id=XyPAoAEACAAJ},
7     year={2014},
8     publisher={Oxford University Press, Incorporated}
9  }
```

Table 1: Boring table

| X | Y |
|---|---|
| 5 | 8 |
| 6 | 9 |
| 7 | :( |

There are many different citation styles, and a lot of customization that is possible, so please check out e.g. [**?**][1].

# 3 Essential packages

This section will list some packages that are essential for lab reports.

**amsmath** provides some useful mathematical definitions (like `\sin` for e.g. $\sin(\omega t)$ and `\lim` for e.g. $\lim_{t\to\infty}$. Also some definitions to make it more convenient to write the math.

**amssymb** provides an extended symbol collection.

**hyperref** makes it possible to create "clickable" links, like `itk.ntnu.no/fag/TTK4115`, but also table 1, eq. (1) and eq. (1b).

**graphicx** provides some useful definitions for dealing with graphics, like \textwidth: \includegraphics[width=\textwidth]{picture} will have the same width as the text column.

**float** makes it easier to place figures, tables, listings etc.

$$J_p \ddot{p} = L_1 V_d \tag{1a}$$

$$J_e \ddot{e} = L_2 \cos(e) + L_3 V_s \cos(p) \tag{1b}$$

$$J_\lambda \ddot{\lambda} = L_4 V_s \cos(e) \sin(p) \tag{1c}$$

More information on these packages can be found in the documentation for each package. The following subsections include some other packages that require a more in-depth explaination.

## 3.1 listings

The `listings` package makes it easy to include code in the report. For example listing 1 includes code that is written in the tex file. However listing 2 simply

---

[1] Even though this cites a web page, scientific writing tries to keep the citation of web pages to a minimum.

Listing 1: Some Matlab code, with the source in the tex file

```matlab
1  degree = 6;
2  out = ones(size(X1(:,1)));
3  for i = 1:degree
4      for j = 0:i
5          out(:, end+1) = (X1.^(i-j)).*(X2.^j);
6      end
7  end
```

Listing 2: Another piece of code, directly from the source file

```matlab
1  degree = 6;
2  out = ones(size(X1(:,1)));
3  for i = 1:degree
4          for j = 0:i
5              out(:, end+1) = (X1.^(i-j)).*(X2.^j);
6          end
7  end
```

takes the code directly from the source file. You can also specify what the code listings should look like: color, line numbers, frames...

This is great! However, try to keep the amount of code in the report to a reasonable level, and remember; code in itself is not an explanation.

See http://ctan.mirrors.hoobly.com/macros/latex/contrib/listings/listings.pdf for more information.

## 3.2  todonotes

The `todonotes` package is great for work in progress. Few things are more embarrassing than forgetting to remove "LALALALAL FIXME!!!!!!" from the middle of your report. Instead, use `\todo{LALALA FIXME!!!}`. This will show up like a red box in the margin. Some prefer `\todo[inline]{FIXME2!!!}` which produces

> FIXME2!!!

LALALA FIXME!!!

To avoid typing [inline] all the time, you can define

```
\newcommand{\TODO}[1]{\todo[inline]{#1}}
```

in the preamble of the document, and use \TODO.

And the best part: When you are finished with your report (or have run out of time) you can simply change \usepackage{todonotes} to \usepackage[disable]{todonotes} and they will all magically disappear!

You can also use \listoftodos to get a list of all the todos in your document, and \missingfigure will create a dummy figure, like fig. 1, that you can replace once you have made a proper figure. This way you can start referencing figures/plots before you make them, and still be reminded that you need to make them.

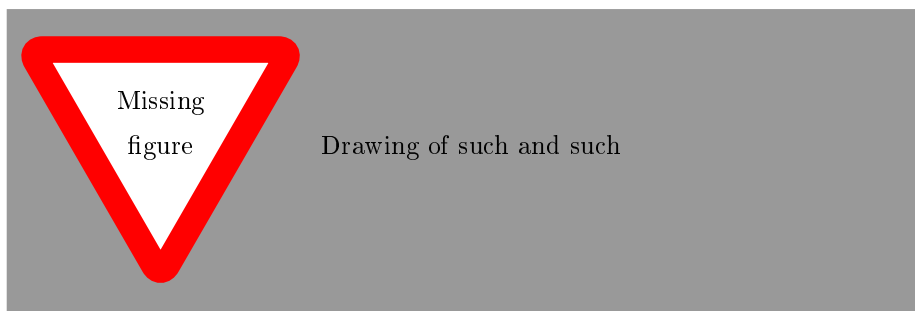See http://ctan.math.utah.edu/ctan/tex-archive/macros/latex/contrib/ todonotes/todonotes.pdf for more information.



Figure 1: Sweet figure, bro!

## 3.3 cleveref

Speaking of referencing: The observant reader might have noticed the use of \cref in referencing tables, figures etc. This is a bit more clever than the normal \ref because it detects what you are referencing based on the prefix of the label. Then it prints the appropriate "prefix". So \cref{fig:my_awesome_fig} will produce fig. 1, whereas \cref{tab:extab} will produce table 1. Notice how the labels of the table and the figureare prefixed with tab: and fig: respectively. If you want it to say e.g. "figure" instead of "fig.", this is completely customizable. There is also \Cref for a capitalized version.

See http://mirrors.ibiblio.org/CTAN/macros/latex/contrib/cleveref/ cleveref.pdf for more information.

# 4   Summary

Hopefully this has been a useful short guide. Please also check out the tex source code. For more inspiration check out [?]. Also, since LaTeX is so extensively used,

StackExchange and Google generally has the answers you are looking for.