<InfPALS/>

LaTeX

Fundamentals of Report Writing

Why do we need it?

- LaTeX:
  - Create high-quality documents with consistent formatting.
  - Handles complex equations and symbols flawlessly, ideal for STEM students.
  - Offers extensive customization options for layout, fonts, and styles.
  - The standard tool for scientific and technical reports (including dissertations and reports for some Informatics modules!)

- Overleaf:
  - Cloud-based editor for LaTeX, meaning you don’t have to install LaTeX locally.
  - Supports collaborative editing.
  - Pro version free with student email.

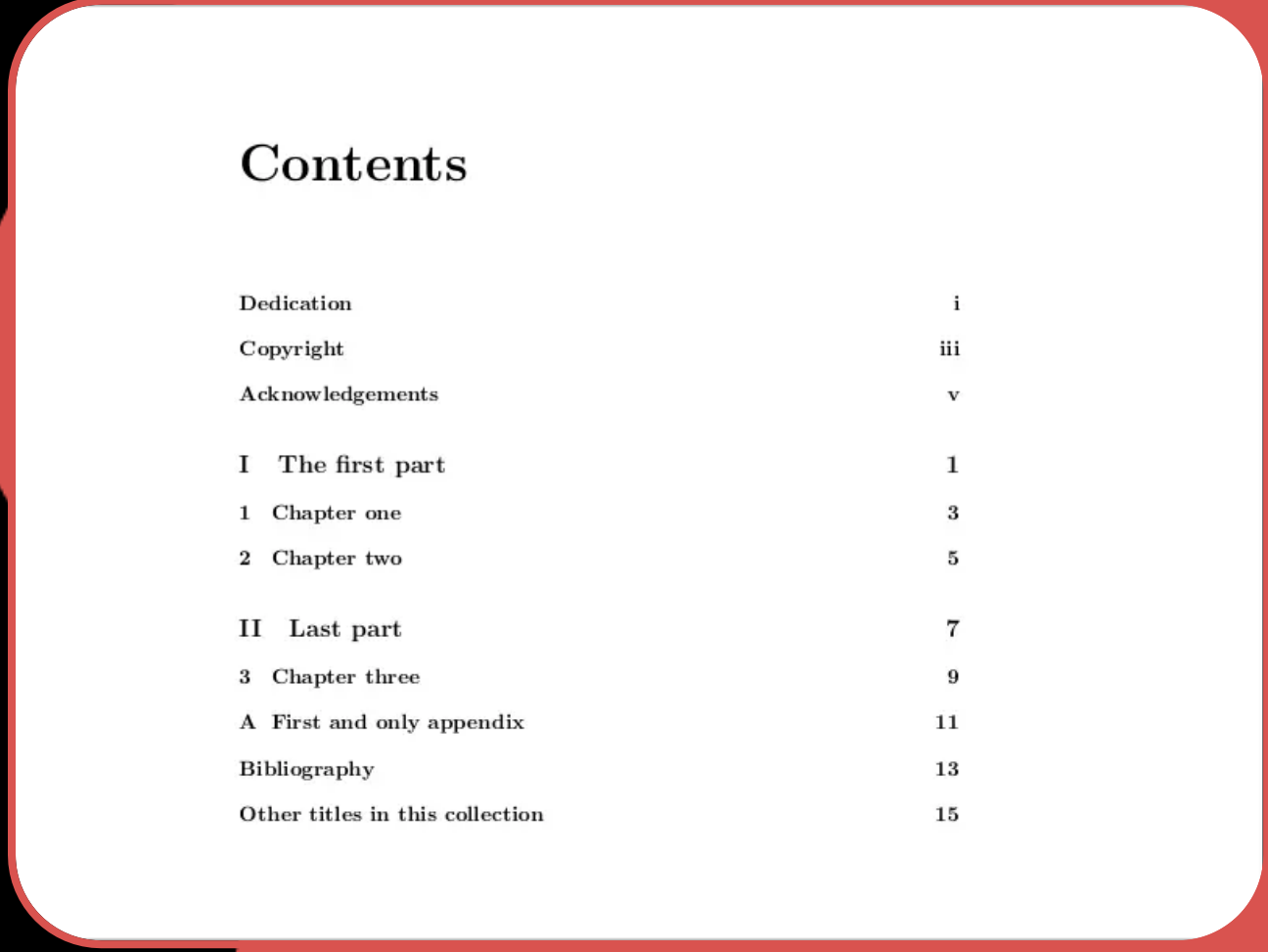
Let’s open Overleaf!

www.overleaf.com

Make an account if you do not already have one

Basic Document Structure

- Classes define overall structure and style: Choose the right one for your document type.
- Common types and their uses:
  - Article: Journal submissions, conference papers, project reports (article)
  - Book: Technical manuals, books (book, report)
  - Letter: Professional correspondence (letter)
  - Slides: Presentations, talks (beamer)
  - Memoir: Highly customised books, dissertations (memoir)
  - Dissertation: School of Informatics have custom classes for UG and PG dissertations.
- Each class comes with pre-defined settings: Page layout, margins, fonts, etc.
- You can also fine-tune within the chosen class framework, e.g. Change section headings: *Section 4 -> Section IV*



Contents

Basic Document Structure

- In LaTeX, every document follows this structure:
  ```
  \documentclass{...}
  \begin{document}
  ...
  \end{document}
  ```
- Between the document class and the begin document is the preamble, this is where you import packages as with other programming languages.
- Between the begin and end document is the body, this is where your content goes.
- If you are using Overleaf, this is all done for you with the blank document template *(see image)*.

```
1  \documentclass{article}
2  \usepackage{graphicx} % Required for inserting images
3
4  \title{Example}
5  \author{Elliot Lister}
6  \date{February 2024}
7
8  \begin{document}
9
10 \maketitle
11
12 \section{Introduction}
13
14 \end{document}
15
```

Your turn!

- Create a Blank Project
- Give it a title of your choice.
- Fill in your name.
- Create 6 sections for:
  - Text
  - Lists
  - Tables
  - Images
  - Equations

Text formatting

- Size Commands:
  - \tiny, \scriptsize, \footnotesize, \small, \normalsize, \large, \Large, \LARGE, \huge
- Style Commands:
  - Bold: \textbf{text}
  - Italics: \textit{text}
  - Underline: \underline{text}
  - Capitalisation:
    - **\uppercase{text}** for all uppercase.
    - **\lowercase{text}** for all lowercase.
    - **\textsc{text}** for small caps.
  - Combinations: \textbf{\textit{emphasized text}}

Your turn!

- In your section “*Text*”, write these sentences in LaTeX:
  - **This is my weird sentence:** (bold)
  - A very (large) very (larger) tiny (largest) **CHICKEN** (bold and uppercase) *ate* (italic) a very (small) big (smallest) worm (underline).
- Do not use the Overleaf Visual Editor

Lists

- Bullet Points:
  - Environment: \begin{itemize}...\end{itemize}
- Enumerations:
  - Environment: \begin{enumerate}...\end{enumerate}
- Each point in the list starts with \item, within either bullets or enumeration – Overleaf may autocomplete this for you.

```
\begin{itemize}
    \item First bullet
\end{itemize}
\begin{enumerate}
    \item First number
\end{enumerate}
```

Your turn!

- In your section “*Lists*”, create a subsection for yourself.
- Inside the subsection create:
  - An unordered list of 5 things you like doing in your free time
  - An ordered list of 5 things which must be included in a *Computer Scientist Starter Pack*

Tables

- Basic tables use the tabular environment:
  - \begin{tabular}{<format>} …\end{tabular}
- Inside the environment, you separate rows with \\ and columns with &
  - e.g. *c1 & c2 & c3* \\ would be a single row entry with 3 columns.
- In the format, you can alter the column widths and their borders.
  - e.g. *| c | c | c |* means there are 3 columns, and they will be fully bordered vertically.
- To add horizontal borders, use ***\hline*** within the rows of the environment.
- This can (and should) be wrapped in the table environment using **\begin{table}…\end{table}**
  - This allows for the addition of captions and labels – which allow you to refer to your table, e.g. *See Table 2.*

```
\begin{tabular}{ |c|c|c| }
 \hline
 col1 & col2 & col3 \\
 \hline
 \hline
 cell1 & cell2 & cell3 \\
 cell4 & cell5 & cell6 \\
 cell7 & cell8 & cell9 \\
 \hline
\end{tabular}
```

col1	col2	col3
cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Your turn!

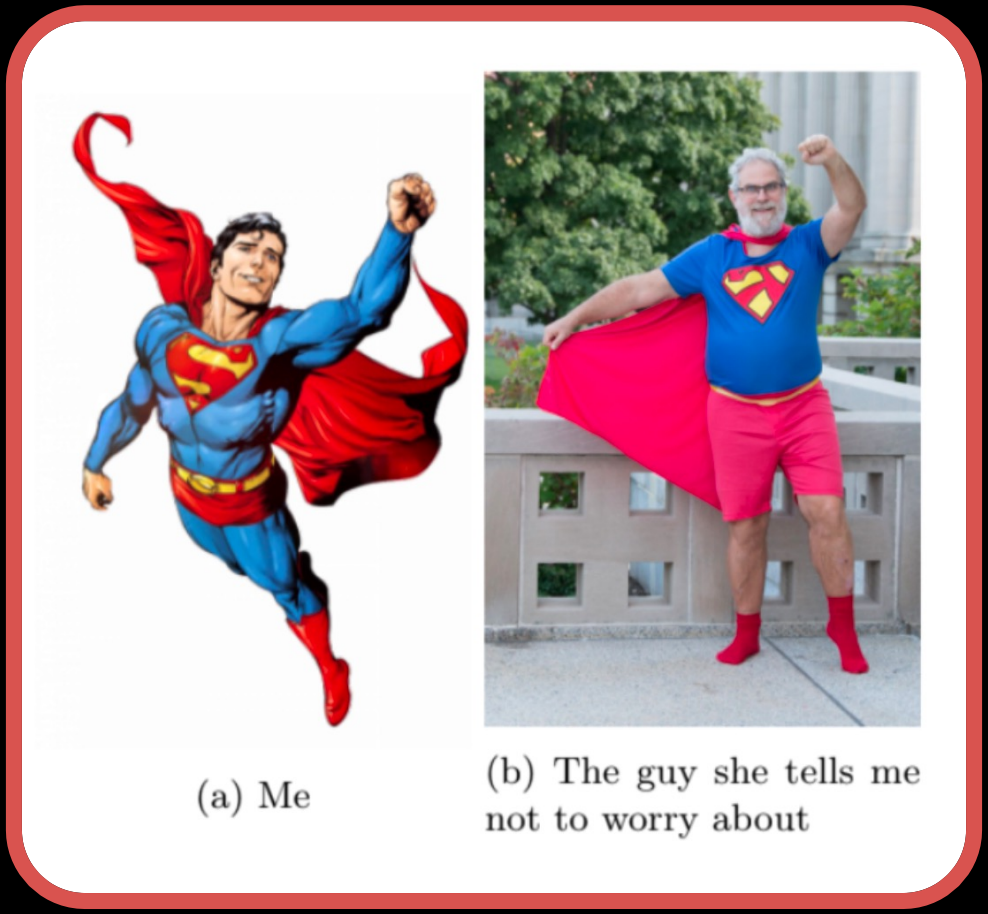
- In your section “*Tables*”, create table with 3 columns
  - Course
  - Year
  - Rating (1-5)
- Add your courses so far and fill in the table.

Images

- Images require the *graphicx* package.
  - Overleaf should import this by default.
- Using includegraphics, you can import a picture:
  - \includegraphics[<options>]{<path>}
  - Options include width, height, etc.
  - e.g. \includegraphics[width=\linewidth]{myimage.png}
- For reports it is good to wrap your image in a figure.
  - \begin{figure}...\end{figure}
  - Within the figure you can give captions and labels as with tables.

Your turn!

- In your section “*Images*”, try to recreate:



(a) Me

(b) The guy she tells me not to worry about

Equations

- LaTeX has two main ways of writing expressions
  - **Inline math mode:**
    - \(...\)
    - $...$
    - \begin{math}...\end{math}
  - **Display math mode (i.e. on a separate line):**
    - \[...\]
    - \begin{displaymath}...\end{displaymath}
    - \begin{equation}...\end{equation}

Equations

- There are too many symbols to cover in one workshop, but here are the basics:
  - Caret (^) - makes text move up, such as exponents.
  - Underscore (_) - makes text move down.
  - \frac{<num>}{<denom>} returns a fraction with the inputs being the numerator and denominator.
  - \int creates an integral symbol, use ^ and _ to set limits.
  - \sqrt{} returns a square root around the parameter.
  - \gamma gives lowercase gamma, \Gamma gives uppercase
    - Same applies to all Greek letters.
  - \mathrm{} removes the italics in math mode
    - e.g. d\mathrm{x} would give $d\mathrm{x}$
- Any others, LaTeX is well documented, Google is your friend
  - e.g. Search *'Degree symbol LaTeX'*

Your turn!

- In your section *"Equations"*, recreate:

$$F(y) = \int_{-\infty}^{y} \frac{1}{\sqrt{2\pi\sigma^2}} e^{\frac{-(x-\mu)^2}{2\sigma^2}} dx$$

- *Hint: if you need to put more than one character in an exponent use {}, i.e. ^{xyz}*