An Introduction to LaTeX

Make Documents Like A PROgrammer

Wesley T. Honeycutt

University of Oklahoma

October 10, 2018

If you want to follow along

https://github.com/BlueNalgene/Introduction_to_LaTeX

History

In 1978, Donald Knuth created the TeX programming language in a fit of frustration with how ugly photoprinting looked.

In 1983, Leslie Lamport released LaTeX (Layman's TeX), a set of macros which made TeX usable by mortals.

There are many other variants such as :

BibTeX ConTeXt LuaTeX LyX pdfLaTeX XeLaTeX

LATEX is. . .

. . . a sophisticated document preparation sytem.

LATEX has. . .

- ▶ Stylistic uniformity
- ▶ Bibliography support
- ▶ Sophisticated structuring abilities
- ▶ Reference tracking
- ▶ Highly extendible capabilities

LATEX is not. . .

. . . a word processor.

LATEX does not. . .

- ▶ Spell-check your documents
- ▶ Give you complete control over formatting
- ▶ Provide a graphical interface for editing

"You take care of writing, and we'll take care of presentation."

You might be used to WYSIWYG

What
You
See
Is
What
You
Get

LATEXis WYSIWYM

What
You
See
Is
What
You
Mean

Presentation matching what you wrote, not how it was written

This text is spaced specially.

```
1  This      text is
2  spaced        specially.
```

Paragraphs are easy.
Use double line breaks.

```
1  Paragraphs are easy.
2
3  Use double line breaks.
```

Never break the unbreakable unless you want to.
You can force connections of words in a line or force spaces and
linebreaks.

```
1  Never break the unbreakable
        unless you want to.
2
3  You~can~force~connections~of~
        words~in~a~line~or\ force
        \ spaces and\\linebreaks.
```

If you like to suffer

LaTeX is coded as plaintext. If you really want to, you can do everything in a Notepad-like text editor.

The code is processed via command line:

```
pdflatex thefile.tex
```

There are add-ons for popular text editors

- *vim*: LaTeXsuite for vim

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- *Sublime Text*: LaTeXTools

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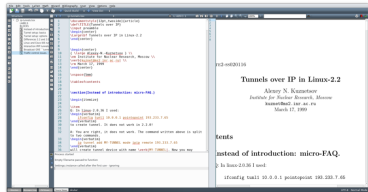
- *vim*: LaTeXsuite for vim
- *emacs*: Latexmk
- *Notepad++*: Requires multiple tweaks
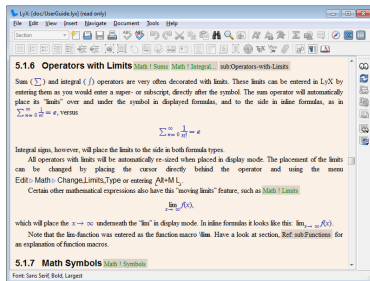- *Sublime Text*: LaTeXTools
- *Atom*: LaTeXapm

Lots of LaTeX IDE's
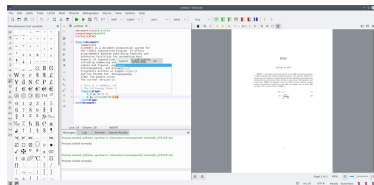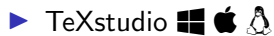
- TeXstudio ⊞ 🍎 🐧

Lots of LaTeX IDE's

- TeXstudio ⊞ 🍎 🐧
- Texmaker ⊞ 🍎 🐧

Lots of LATEX IDE's

- TeXstudio ⊞ 🍎 🐧
- Texmaker ⊞ 🍎 🐧
- LyX ⊞ 🍎 🐧

Lots of LaTeX IDE's

- TeXstudio 🪟 🍎 🐧
- Texmaker 🪟 🍎 🐧
- LyX 🪟 🍎 🐧
- MacTeX 🍎

Lots of LATEX IDE's

- TeXstudio ⊞ 🍎 🐧
- Texmaker ⊞ 🍎 🐧
- LyX ⊞ 🍎 🐧
- MacTeX 🍎
- MiKTeX ⊞
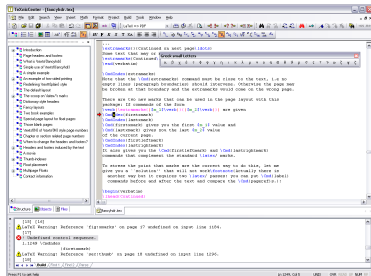
Lots of LaTeX IDE's

- TeXstudio ⊞ ⌘ 🐧
- Texmaker ⊞ ⌘ 🐧
- LyX ⊞ ⌘ 🐧
- MacTeX ⌘
- MiKTeX ⊞
- TeX Live 🐧

Online collaborative options
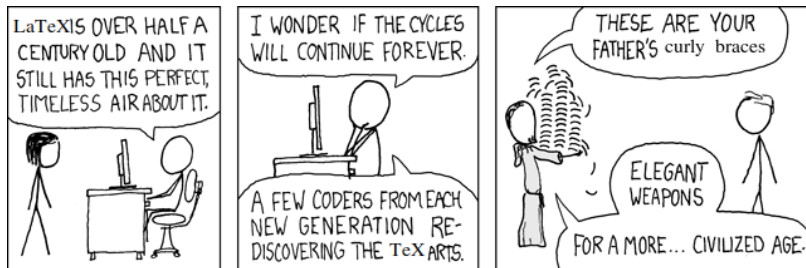
- Overleaf/ShareLaTeX

Online collaborative options

- Overleaf/ShareLaTeX
- Authorea

Online collaborative options

- Overleaf/ShareLaTeX
- Authorea
- There are others which I have no experience with.

Learn to love braces

Commands and Environments

Uncentered

```
1  Uncentered
```

Centered Environment

```
1  \begin{center}
2    Centered Environment
3  \end{center}
```

Command Centered

```
1  \centering
2  Command Centered
```

The Logical Structure of a LaTeX Document

Preamble

▶ Declare the document type you will be making:
\documentclass[options]{class}

The Logical Structure of a LaTeX Document

Preamble

- Declare the document type you will be making:
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- Declare what packages you will need:
  \usepackage[options]{package}

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  \documentclass[options]{class}
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  \usepackage[options]{package}
- ▶ Define any custom functions or environments

The Logical Structure of a LaTeX Document

Preamble

- ▶ Declare the document type you will be making:
  \documentclass[options]{class}
- ▶ Declare what packages you will need:
  \usepackage[options]{package}
- ▶ Define any custom functions or environments
- ▶ Declare important variables

Body

- Initialize the document in an environment
  \begin{document}
      . . .
  \end{document}

Body

- ▶ Initialize the document in an environment
  \begin{document}
  ...
  \end{document}
- ▶ Within this environment you will:

The Logical Structure of a LATEX Document cont'd

Body

- ▶ Initialize the document in an environment
  \begin{document}
     . . .
  \end{document}
- ▶ Within this environment you will:
  - ▶ Create the title page or section:
    \maketitle

The Logical Structure of a LaTeX Document cont'd

Body

- ▶ Initialize the document in an environment
  \begin{document}

      . . .

  \end{document}
- ▶ Within this environment you will:
  - ▶ Create the title page or section:
    \maketitle
  - ▶ Write your document

The simplest document

The simplest

Wes Honeycutt

October 10, 2018

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

1

```
\documentclass{article}
\usepackage{lipsum}
\title{The simplest}
\author{Wes Honeycutt}
\begin{document}
  \maketitle
  \lipsum[1]
\end{document}
```

Making the \maketitle

The title can include several elements, which are declared by the user.

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}

Making the \maketitle

The title can include several elements, which are declared by the user.

- \title{The Title}
- \author{The Author's Name}
    - This can include \thanks{Some Institution}

Making the \maketitle

The title can include several elements, which are declared by the user.

- ► \title{The Title}
- ► \author{The Author's Name}
  - ► This can include \thanks{Some Institution}
- ► \subtitle{A Clever Subtitle}

Making the \maketitle

The title can include several elements, which are declared by the user.

- ▶ \title{The Title}
- ▶ \author{The Author's Name}
  - ▶ This can include \thanks{Some Institution}
- ▶ \subtitle{A Clever Subtitle}
- ▶ \subject{A Subject Heading}

Our Sample Title Page

```
\title{The Pitfalls of LaTeX}

\author{
  Wesley T. Honeycutt
  \thanks{University of Oklahoma Department of Biology}
  \and Leon the Cat}

\subtitle{Stackexchange was down and other horror stories}

\subject{A Joke Paper}
```

\documentclass{article}

Stack Exchange was down and other horror stories A Joke Paper

The Pitfalls of LaTeX

Wesley T. Honeycutt [*]   Leon the Cat

October 10, 2018

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

---
[*]University of Oklahoma Department of Biology

\documentclass{scrbook}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

A Joke Paper

The Pitfalls of LaTeX

Stack Exchange was down and other horror stories

Wesley T. Honeycutt *   Leon the Cat

October 10, 2018

*University of Oklahoma Department of Biology

2

\documentclass{report}

Stack Exchange was down and other horror stories A Joke Paper

The Pitfalls of LaTeX

Wesley T. Honeycutt [1]   Leon the Cat

October 10, 2018

[1]University of Oklahoma Department of Biology

\documentclass{elsarticle}

The Pitfalls of LaTeX

Wesley T. Honeycutt [1]   Leon the Cat Lorem ipsum dolor

sit amet, consectetuer adipiscing elit. Ut purus elit, vestibulum ut, placerat
ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero,
nonummy eget, consectetuer id, vulputate a, magna. Donec vehicula augue eu
neque. Pellentesque habitant morbi tristique senectus et netus et malesuada
fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla
et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor
gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc.
Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor
nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper
nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend,
sagittis quis, diam. Duis eget orci sit amet sem dignissim rutrum.

Publisher Distributed Classes

The previous example shows how different classes rearrange the same elements.

Publisher Distributed Classes

The previous example shows how different classes rearrange the same elements.

Academic Publishers

Elsevier - *elsarticle*
Springer - *llncs*
IEEE - *IEEEtran*
AMS - *amscls*

Some More Academic Publishers With Classes

- ▶ aaai www.aaai.org
- ▶ AAAS/science www.sciencemag.org
- ▶ American Chemical Society Publications
- ▶ Addison-Wesley
- ▶ algebra universalis
- ▶ American Institute of Physics www.aip.org
- ▶ American Meteorological Society www.ametsoc.org
- ▶ American Physical Society authors.aps.org
- ▶ Beech Stave Press
- ▶ Birkhuser
- ▶ Cambridge University Press
- ▶ CRC
- ▶ Documenta Mathematica www.math.uiuc.edu
- ▶ Docscape
- ▶ Engine House Books

Some More Academic Publishers With Classes

- ▶ Fondo de Cultura Econmica
- ▶ Informs joc.pubs.informs.org
- ▶ Institut Mittag-Leffler (Royal Swedish Academy of Sciences)
- ▶ www.arkivformatematik.org
- ▶ IOP (institute of physics) authors.iop.org
- ▶ John Benjamins Publishing Company
- ▶ London Mathematical Society books www.lms.ac.uk
- ▶ Louisiana State University Press
- ▶ Mathematical Association of America www.maa.org
- ▶ National Research Council of Canada
- ▶ Oxford University Press www.oup.co.uk
- ▶ Princeton University Press press.princeton.edu
- ▶ Publications de l'Institut Mathmatique (Beograd) www.emis.de

Some More Academic Publishers With Classes

- ▶ SAS Institute
- ▶ SIAM books www.siam.org
- ▶ Springer math www.springer.com
- ▶ Springer physics www.springer.com
- ▶ Thomson Delmar Learning
- ▶ UIT Cambridge
- ▶ Unipress (Institute of High Pressure Physics, Polish Academy of Sciences)
- ▶ www.unipress.waw.pl
- ▶ University of California Press
- ▶ Wiley www.wiley.com
- ▶ William Andrew Publishing
- ▶ World Scientific
- ▶ WordTech

Section Hierarchy

```
\section{The Topmost}
    \subsection{A Little Deeper}
        \subsubsection{Deeper Still}
                                    ...
```

Text Formats

Be **Bold**!
Italicize!
<u>Underline</u> to accentuate!
Write with *emphasis*!

```
1  Be \textbf{Bold}!\\
2  \textit{Italicize}!\\
3  \underline{Underline} to
       accentuate!\\
4  Write with \emph{emphasis}!\\
```

Font Size

I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking
I'm shrinking

```
1  {\Huge I'm shrinking}\\
2  {\huge I'm shrinking}\\
3  {\LARGE I'm shrinking}\\
4  {\Large I'm shrinking}\\
5  {\large I'm shrinking}\\
6  {\normalsize I'm shrinking}\\
7  {\small I'm shrinking}\\
8  {\footnotesize I'm shrinking
       }\\
9  {\scriptsize I'm shrinking}\\
10 {\tiny I'm shrinking}\\
```

Lists

- ▶ Boomer
- ▶ Sooner
- ▶ Oklahoma

```
1  \begin{itemize}
2    \item Boomer
3    \item Sooner
4    \item Oklahoma
5  \end{itemize}
```

1. Boomer
2. Sooner
3. Oklahoma

```
1  \begin{enumerate}
2    \item Boomer
3    \item Sooner
4    \item Oklahoma
5  \end{enumerate}
```

Nested Lists

- ▶ Boomer
  - ▶ Sooner
- ▶ Oklahoma

```
1  \begin{itemize}
2    \item Boomer
3    \begin{itemize}
4      \item Sooner
5    \end{itemize}
6    \item Oklahoma
7  \end{itemize}
```

1. Boomer
   1.1 Sooner
2. Oklahoma

```
1  \begin{enumerate}
2    \item Boomer
3    \begin{enumerate}
4      \item Sooner
5    \end{enumerate}
6    \item Oklahoma
7  \end{enumerate}
```

Graphics

Tables

Math

Graphics Generation with TikZ

High quality vector images can be produced from within LaTeX using a package called TikZ.
Additionally, Inkscape can export TikZ directly.

```
\begin{tikzpicture}
\draw \pdiff (0,.25) -- (0,3) -- (1,3) -- (1,2.5) to [out
    =270,in=180] (1.5,2) -- (3.75,2) to [out=0,in=270]
    (4.25,2.5) -- (4.25,3) -- (6.75,3) -- (6.75,2.5) to [out
    =270,in=180] (7.25,2) -- (9.5,2) to [out=0,in=270]
    (10,2.5) -- (10,3) -- (11,3) -- (11,.25) -- (0,.25) node
     [midway,above] {p doped Si};
\draw \metalthree (0,0) rectangle (11,.25) node [midway,
    color=white]
{Si Substrate};
\draw \oxide (4,3) rectangle (7,4) node [pos=.5,font=\bf\
    Large] {oxide};
\draw \metalone (4,4) rectangle (7,4.5);
\draw \ndiff (4.25,3) -- (1,3) -- (1,2.5) to [out=270,in
    =180] (1.5,2) -- (3.75,2) to [out=0,in=270] (4.25,2.5)
    -- (4.25,3) node at (2.625,2.5) [align=center] {n-type};
\draw \ndiff (10,3) -- (6.75,3) -- (6.75,2.5) to [out=270,in
    =180] (7.25,2) -- (9.5,2) to [out=0,in=270] (10,2.5) --
    (10,3) node at (8.375,2.5) [align=center] {n-type};
\draw \metalone (1.25,3) rectangle (3,3.5);
\draw \metalone (8,3) rectangle (9.75,3.5);
\draw [->] (1,5) node [above] {Source} -- (2.125,3.5);
\draw [->] (10,5) node [above] {Drain} -- (8.975,3.5);
\draw [->] (5.5,5) node [above] {Gate} -- (5.5,4.5);
\node at (5.5,-.5) [align=center] {$V_{GS} < V_{threshold}$
    };
\end{tikzpicture}
```

MOSFET
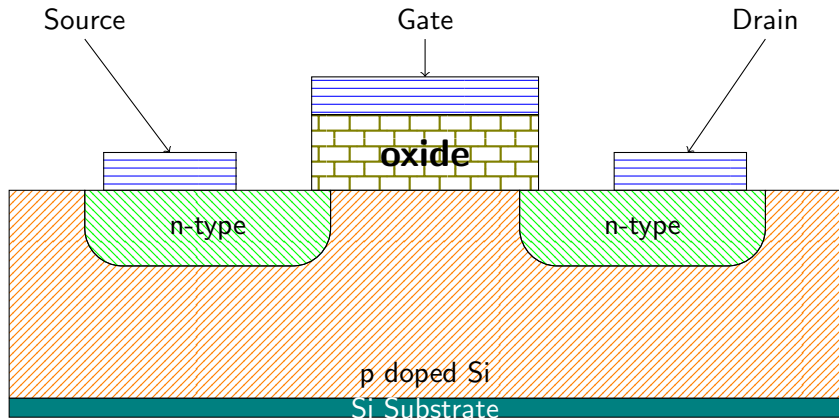
$V_{GS} < V_{threshold}$

MOSFET
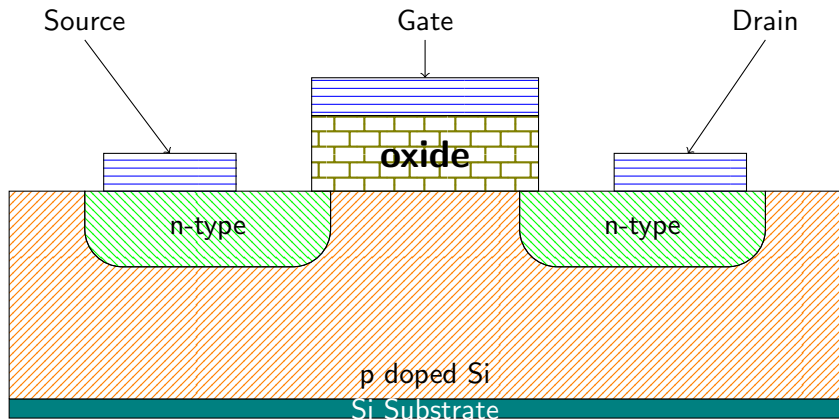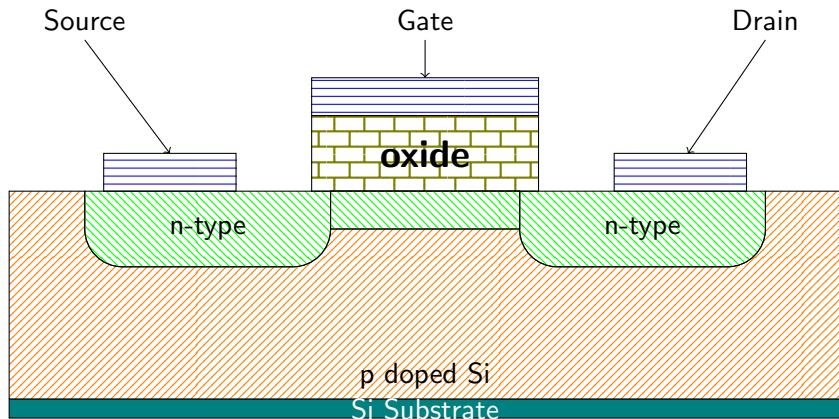
Source

Gate

Drain

oxide

n-type

n-type

p doped Si

Si Substrate

$$V_{GS} \geq V_{threshold}$$
$$V_{DS} < V_{GS} - V_{threshold}$$

MOSFET

$$V_{GS} \geq V_{threshold}$$
$$V_{DS} < V_{GS} - V_{threshold}$$

MOSFET

Source   Gate   Drain

oxide

n-type   n-type

p doped Si

Si Substrate
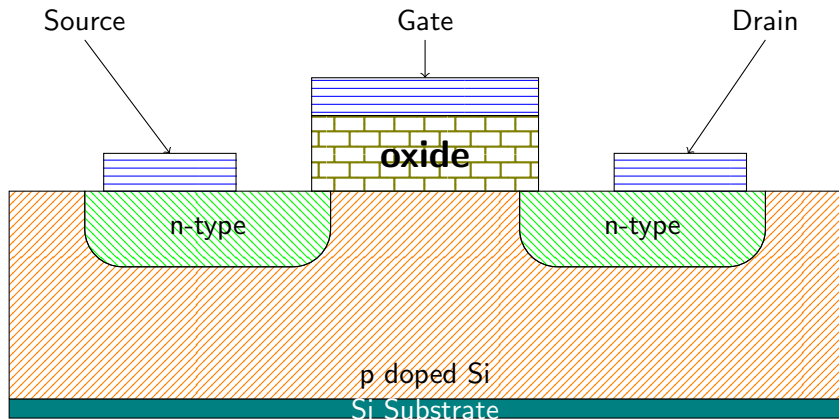
$$V_{GS} \geq V_{threshold}$$
$$V_{DS} = V_{GS} - V_{threshold}$$
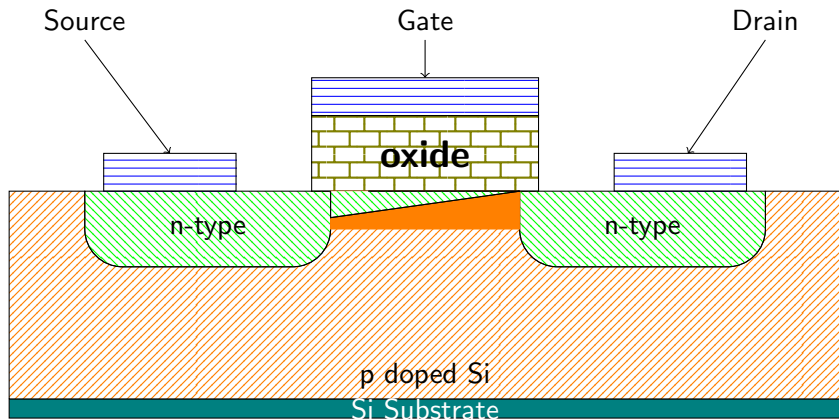
MOSFET

$$V_{GS} \geq V_{threshold}$$
$$V_{DS} = V_{GS} - V_{threshold}$$
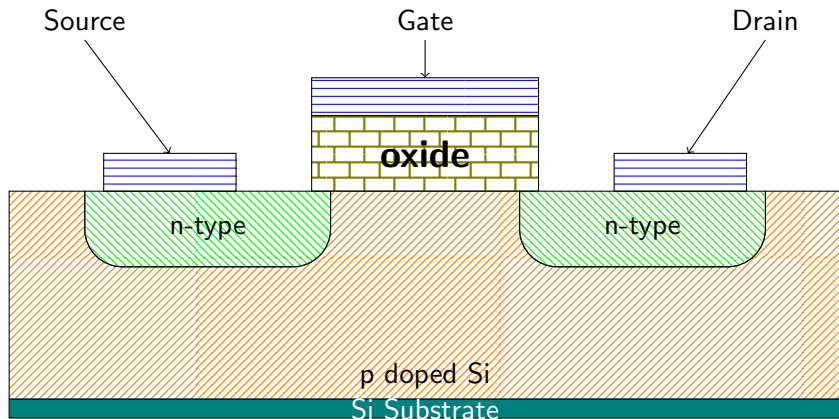
MOSFET

$$V_{GS} \geq V_{threshold}$$
$$V_{DS} > V_{GS} - V_{threshold}$$

MOSFET
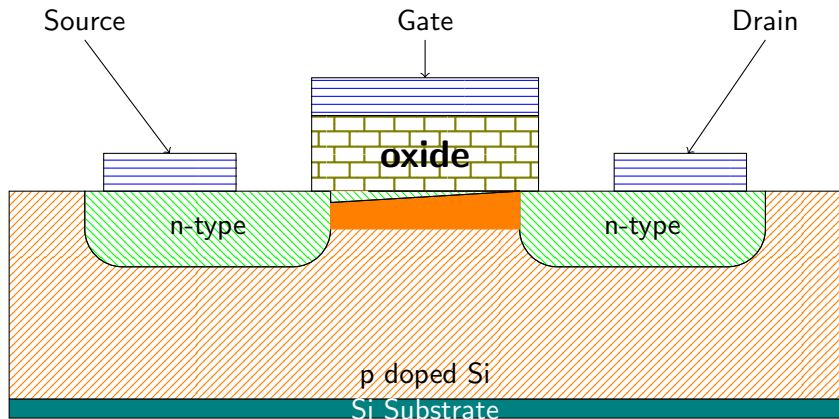
$$V_{GS} \geq V_{threshold}$$
$$V_{DS} > V_{GS} - V_{threshold}$$

Super Powerful for Theses

2.7 LOCATION AND FACILITIES

Redcedar Products is seeking an industrial facility near Stillwater, Oklahoma to start operations. It is estimated that currently, 25% of the state is covered with eastern redcedar (Figure 1). As satellite imaging shows (Figure 2), Payne county in particular has a large number of these trees in the vicinity. Considering access to plenty of foliage, Stillwater offers the benefits of proximity to a large research institution which can benefit company growth. The facility will offer storage for purchased foliage and a factory containing extraction equipment. A small office will be utilized for administration activities and a small conference room.
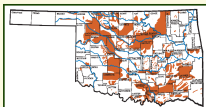
FIGURE 1: A CARTOON OF THE DISTRIBUTION OF REDCEDAR OVER OKLAHOMA.
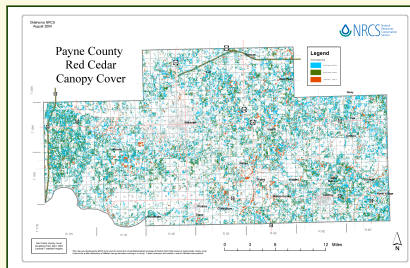
FIGURE 2: A DETAILED MAP OF THE REDCEDAR GROWTH IN PAYNE COUNTY PRODUCED FROM SATELLITE IMAGING COMPILED BY THE NRCS.

Make a Custom Class

https://github.com/ludus-leonis/nipajin

Make a Custom Class

Make a Custom Class

https://github.com/raphink/geneve_1564

Make a Custom Class

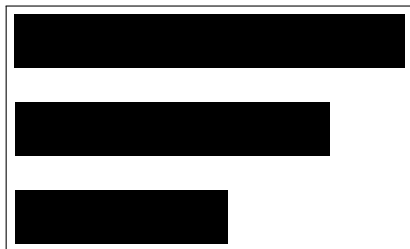https://github.com/alexisflesch/nexus

Unique Words and Hypenation

LaTeX automatically hyphenates words in the dictionary. What if you have something that isn't common?

```
\hyphenation{Red-ce-dar May-ap-ple Ok-la-ho-ma che-mo-ther
    -apy through}
```

Do calculations

LATEXwasn't made for math, but you do have access to registers . . .

\usepackage{calc}


```
1 \newlength{\mylength}
2 \setlength{\mylength}{\
      textwidth}%
3 \noindent\rule{\mylength}{20pt}
4
5 \bigskip
6 \setlength{\mylength}{\
      textwidth-1cm}%
7 \noindent\rule{\mylength}{20pt}
8
9 \bigskip
10 \setlength{\mylength}{\
      textwidth-80pt+5mm-1bp}%
11 \noindent\rule{\mylength}{20pt}
```

Do calculations

...and floating points.

\usepackage{fp}

The following arithmetic is easy:

- $5 + 6 = 11$
- $2 + 3/5 \times \pi = 3.88496$

```
1 The following arithmetic is
      easy:
2 \begin{itemize}
3 \item \FPeval{\result}{clip
      (5+6)}%
4 $5+6=\result$
5 \item \FPeval{\result}{round
      (2+3/5*pi,5)}%
6 $2+3/5\times\pi=\result$
7 \end{itemize}
```

I use math for my consulting invoices.

Wesley Honeycutt

111 Chesapeake St.   (405) 555-5555

Norman, OK 73019   honeycutt@ou.edu

Invoice To:

Jimmy Gallogly
University of Oklahoma
660 Paddington Oval
Norman, OK 73019

Invoice Date: **Invoice Terms**

October 10, 2018   Due on Receipt

Description of Services	Quantity	Unit Price	Amount
Purchased Materials			
Beard Growth Oil		$337.39	$337.39
Consulting Services			
July 9th, 2018	1.00 hours	$12.00	$12.00
July 10th, 2018	8.00 hours	$34.00	$272.00
July 11th, 2018	3.00 hours	$12.00	$36.00
July 14th, 2018	3.00 hours	$34.00	$102.00
July 15th, 2018	3.00 hours	$12.00	$36.00
July 20th, 2018	1.00 hours	$34.00	$34.00
July 21st, 2018	2.00 hours	$12.00	$24.00
July 31st, 2018	4.00 hours	$34.00	$136.00
Balance Due			**$989.39**

RTFM

The Comprehensive TeX
Archive Network is a package
repository

This also includes manuals
and examples

When in doubt: Google

$T_{\!E}\!X$ is older than the Happy Meal.

When in doubt: Google

T_EX is older than the Happy Meal.

Someone has likely experienced your pain.

When in doubt: Google

T$_{\!E}$X is older than the Happy Meal.

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https://tex.stackexchange.com/

At your local library

OU libraries has a LaTeX expert:

Amanda Schilling
🔗: Stem Services
📞: (405) 325-6126
✉: amanda.schilling@ou.edu

Office Hours: W/Th 8-9am in DAVIS
M 6-8pm in the Learning Lab

At your local library

OU libraries has a LaTeX expert:

Mark Laufersweiler
⚯: Research Data Specialist
☎: (405) 325-3710
✉: laufers@ou.edu

Or contact me

I'm just a LaTeX junkie:

Wesley T. Honeycutt

⚯: Personal Site

📞: *I have an office phone?*

✉: honeycutt@ou.edu

⬤: https://github.com/BlueNalgene

- ▶ First.
- ▶ Second.
- ▶ Third.

```
1  \begin{itemize}
2    \item First.
3    \item Second.
4    \item Third.
5  \end{itemize}
```

$$x^2 + y^2 = z^2. \qquad (1)$$

```
1  \begin{equation}
2    x^2 + y^2 = z^2.
3  \end{equation}
```