

FMH606 Master's Thesis 2017  
Electrical Power Engineering

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Faculty of Technology, Natural Sciences and Maritime Sciences  
Campus Porsgrunn





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# Preface

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Porsgrunn, 9th May 2017

<Author's Name> or <group code>



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# Nomenclature

bla

Symbol	Explanation
A/D	Analogue-Digital-Converter
CMR	Common Mode Rejection
foo	Foo
bar	Bar



# 1 Introduction

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Figure 1.1: Norwegian (bokmål) variant of the HSN logo

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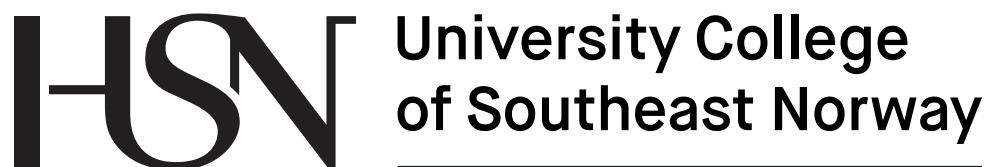


Figure 1.2: English variant of the HSN logo.

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## 1 Introduction

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$$e = mc^2 \tag{1.1}$$

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## 1 Introduction

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## 2 Theory

### 2.1 Maxwell's Equations

The differential forms of Maxwell's equations as found by Heaviside, while completely valid, are now considered somewhat archaic, and have been replaced by the more useful (equivalent) integral forms. Each law is named according to the person(s) who originally discovered the connections represented by the equation. Here are the four equations:

$$\text{Gauss' law for electricity: } \oint \vec{E} \cdot d\vec{A} = \frac{Q_{enc}}{\epsilon_0} \quad (2.1)$$

$$\text{Gauss' law for magnetism: } \oint \vec{B} \cdot d\vec{A} = 0 \quad (2.2)$$

$$\text{Faraday's law: } \oint \vec{E} \cdot d\vec{s} = -\frac{d\phi_b}{dt} \quad (2.3)$$

$$\text{Ampere-Maxwell law: } \oint \vec{B} \cdot d\vec{s} = \mu_0 \epsilon_0 \frac{d\phi_e}{dt} + \mu_0 i_{enc} \quad (2.4)$$

Note:  $\oint$  is used to specify a closed loop integral, also known as a line integral. It simply means that in the calculations, we must go all the way around the loop; we can't stop part way through or the equations won't be valid.

### 2.2 Mathematical model

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## 2 Theory

Table 2.1: The different number systems

7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

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Table 2.2: The weather forecast

Day	Min Temp	Max Temp	Summary
Monday	11C	22C	A clear day with lots of sunshine. However, the strong breeze will bring down the temperatures.
Tuesday	9C	19C	Cloudy with rain, across many northern regions. Clear spells across most of Scotland and Northern Ireland, but rain reaching the far northwest.
Wednesday	10C	21C	Rain will still linger for the morning. Conditions will improve by early afternoon and continue throughout the evening.

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## 2 Theory

habitasse platea dictumst. Pellentesque non elit. Fusce sed justo eu urna porta tincidunt. Mauris felis odio, sollicitudin sed, volutpat a, ornare ac, erat. Morbi quis dolor. Donec pellentesque, erat ac sagittis semper, nunc dui lobortis purus, quis congue purus metus ultricies tellus. Proin et quam. Class aptent taciti sociosqu ad litora torquent per conubia nostra, per inceptos hymenaeos. Praesent sapien turpis, fermentum vel, eleifend faucibus, vehicula eu, lacus.

100-150

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# Appendix A

## Title of Paper A (probably very long and therefore not good to have in the header)

**Note** Since some papers tend to have a rather long title it is good to provide the optional short title which then will be displayed in the table of contents and header instead of the long original title. On the opening page of the chapter the original *long* title will be displayed.

*Short descriptive text of paper follows here.*

The paper itself needs to be included in the published form as PDF on the next pages. This can be done using the `pdfpages` package by adding the command:

```
\includepdf{pages=-,openright}{Filename}
```

You can omit the `.pdf` when specifying the `Filename`. Also you should always include the option `openright` since it would look strange to have the paper starting at the back of the cover page.

There are more options like only adding specific pages:

```
\includepdf{pages=2-6,openright}{Filename.pdf}
```

For more options see Appendix B where the most important pages of the `pdfpages` manual were included using `pdfpages`.



# **Appendix B**

## **Title of Paper B**

Short descriptive text of paper follows here.

Here we included the first five pages of the `pdfpages` manual itself.



# The pdfpages Package\*

Andreas MATTHIAS  
andreas.matthias@gmail.com

2009/02/07

## Abstract

This package simplifies the insertion of external multi-page PDF or PS documents. It supports pdfTeX, VTeX, and XeTeX.

## Contents

<b>1</b>	<b>Introduction</b>	<b>1</b>
<b>2</b>	<b>Usage</b>	<b>2</b>
2.1	Package Options	2
2.2	Commands	2
2.3	The Layout	10
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<b>3</b>	<b>Required Packages</b>	<b>11</b>
<b>4</b>	<b>Acknowledgment</b>	<b>11</b>

## 1 Introduction

When creating PDF documents, it is sometimes useful to insert pages of other, external PDF documents. This can be done with the `\includegraphics` command from the `graphics` package. But a simple `\includegraphics{doc.pdf}` normally produces ‘Overfull \hbox’ and ‘Overfull \vbox’ warnings, because the size of the inserted pages does not match the print space.

The `pdfpages` package makes it easy to insert pages of external PDF documents without worrying about the print space. Here are some features of the `pdfpages` package: Several logical pages can be arranged onto each sheet of paper and the layout can be changed individually. A lot of hypertext operations are supported, like links to the inserted pages, links to the original PDF document, threads, etc. When working with VTeX the same is possible with PostScript documents, too. Note that PostScript documents are only supported by VTeX and *not* by pdfLaTeX.

---

\*This file has version number v0.4g, last revised 2009/02/07.

When producing DVI output `pdfpages` cannot insert pages of a PDF documents. But instead of interrupting execution `pdfpages` will insert empty pages. This feature is important when using packages like `pst-pdf`, which need to produce DVI output at the first run.

## 2 Usage

### 2.1 Package Options

`\usepackage[<options>]{pdfpages}`

*<option>* – **final**: Inserts pages. This is the default.

**draft**: Does not insert pages, but prints a box and the filename instead.

**enable-survey**: Activates survey functionalities. (*experimental, subject to change*)

### 2.2 Commands

`\includepdf` Inserts pages of an external PDF document.

`\includepdf[<key=val>]{<filename>}`

*<key=val>* – A comma separated list of options using the *<key>=<value>* syntax.

*<filename>* – Filename of the PDF document. (The filename *must not* contain any blanks!)

The following list describes all possible options of `\includepdf`. All options are using the *<key=value>* syntax.

- Main options:

**pages** Selects pages to insert. The argument is a comma separated list, containing page numbers (**pages={3,5,6,8}**), ranges of page numbers (**pages={4-9}**) or any combination. To insert empty pages use **{}**.

E.g.: **pages={3,{},8-11,15}** will insert page 3, an empty page, and pages 8, 9, 10, 11, and 15.

Page ranges are specified by the following syntax: *<m>-<n>*. This selects all pages from *<m>* to *<n>*. Omitting *<m>* defaults to the first page; omitting *<n>* defaults to the last page of the document. Another way to select the last page of the document, is to use the keyword **last**. (This is only permitted in a page range.)

E.g.: **pages=-** will insert *all* pages of the document, and **pages=last-1** will insert all pages in reverse order.

(Default: **pages=1**)

**nup** Puts multiple logical pages onto each sheet of paper. The syntax of this option is: **nup=<xnup>x<ynup>**. Where *<xnup>* and *<ynup>* specify the number of logical pages in horizontal and vertical direction, which are arranged on each sheet of paper. (Default: **nup=1x1**)

**landscape** Specifies the format of the sheet of paper, which is rotated by 90 degrees. This does *not* affect the logical pages, which will *not* be rotated by the ‘landscape’ option. To rotate the logical pages use the ‘angle’ option (e.g. ‘angle=90’). Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `landscape=false`)

- Layout options:

**delta** Puts some horizontal and vertical space between the logical pages. The argument should be two dimensions, separated by space. See Chapter 2.3 and Figure 1. (Default: `delta=0 0`).

**offset** Displaces the origin of the inserted pages. The argument should be two dimensions, separated by space. In ‘oneside’ documents positive values shift the pages to the *right* and to the *top* margin, respectively, whereas in ‘twoside’ documents positive values shift the pages to the *outer* and to the *top* margin, respectively. See Chapter 2.3 and Figure 1. (Default: `offset=0 0`)

**frame** Puts a frame around each logical page. The frame is made of lines of thickness `\fboxrule`. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `frame=false`)

**column** Pdfpages normally uses ‘row-major’ layout, where successive pages are placed in rows along the paper. The `column` option changes the output into a ‘column-major’ layout, where successive pages are arranged in columns down the paper. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `column=false`)

**columnstrict** By default the last page is not set in a strict ‘column-major’ layout, if the logical pages do not fill up the whole page. The `columnstrict` option forces a strict ‘column-major’ layout for the last page. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `columnstrict=false`)

1	4	
2	5	
3		

`columnstrict=true`

1	3	5
2	4	

`columnstrict=false`

**openright** This option puts an empty page before the first logical page. In combination with `nup=2x1`, `nup=2x2`, etc., this means that the first page is on the right side. The same effect can be achieved with the `pages` option, if an empty page is inserted in front of the first page. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `openright=false`)

**pagecommand** Declares L<sup>A</sup>T<sub>E</sub>X commands, which are executed on each sheet of paper. (Default: `pagecommand={\thispagestyle{empty}}`)

**turn** By default pages in landscape format are displayed in landscape orientation (if the PDF viewer supports this). With `turn=false` this can be prohibited. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `turn=true`)

**noautoscale** By default pages are scaled automatically. This can be suppressed with the `noautoscale` option. In combination with the `scale`

- option (from `graphicx`) the user has full control over the scaling process. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `noautoscale=false`)
- fitpaper** Adjusts the paper size to the one of the inserted document. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `fitpaper=false`)
- reflect** Reflects included pages. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `reflect=false`)
- signature** Creates booklets by rearranging pages into signatures and setting `nup=1x2` or `nup=2x1`, respectively. This option takes one argument specifying the size of the signature, which should be a multiple of 4.  
An example for documents in portrait orientation:  
`\includepdf[pages=-, signature=8, landscape]{portrait-doc.pdf}`  
An example for documents in landscape orientation:  
`\includepdf[pages=-, signature=8]{landscape-doc.pdf}`
- signature\*** Similar to **signature**, but now for right-edge binding.
- booklet** This option is just a shortcut of the ‘signature’ option, if you choose a signature value so large that all pages fit into one signature. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `booklet=false`)
- picturecommand** Declares picture commands which are executed on every page within a picture environment with the base point at the lower left corner of the page. (The base point does not change if the page is rotated, e.g. by the `landscape` option.) (Default: `picturecommand={}`)
- picturecommand\*** Like **picturecommand**, but with the restriction that **picturecommand\*** executes its picture commands only on the very first page. (Default: `picturecommand*={}`)
- pagetemplate** By default the first inserted page will be used as a template. This means that all further pages are scaled such that they match within the contour of this first page. This option allows to declare another page to be used as a template; which is only useful if a PDF document contains different page sizes or page orientations. The argument should be a page number. (Default: `pagetemplate=\langle first inserted page \rangle`)
- templatesize** This option is similar to the **pagetemplate** option, but its arguments specify the size of the template directly. Its syntax is: `templatesize={\langle width \rangle}{\langle height \rangle}`, e.g. `templatesize={615pt}{846pt}`. Note: The two lengths should be a bit larger than desired, to keep away from rounding errors.  
(Default: `templatesize=\langle size of the first inserted page \rangle`)
- rotateoversize** This option allows to rotate oversized pages. E.g. pages in landscape orientation are oversized relatively to their portrait counterpart, because they do not match within the contour of a portrait page without rotating them. By default oversized pages are scale and are *not* rotated. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `rotateoversize=false`)



**doublepages** Inserts every page twice. This is useful for 2-up printing, if one wants to cut the stack of paper afterwards to get two copies. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `doublepages=false`)

**doublepagestwist** Whereas with **doublepages** the cutting edge is once on the inner side and ones on the outer side, **doublepagestwist** turns the pages such, that the cutting edge is always on the inner side. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `doublepagestwist=false`)

**doublepagestwistodd** Turns the pages such, that the cutting edge is always on the outer side. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `doublepagestwistodd=false`)

**doublepagestwist\*** Like **doublepagestwist** but for double side printing. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `doublepagestwist*=false`)

**doublepagestwistodd\*** Like **doublepagestwistodd** but for double side printing Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `doublepagestwistodd*=false`)

- Miscellaneous options:

**lastpage** In DVI mode pdfpages cannot determine the number of pages of the included document. So this option is suitable to specify the number of pages. This option is only used in DVI mode and has no meaning in any other mode. The argument should be a page number. (Default: `lastpage=1`)

- Hypertext options:

**link** Inserted pages become a target of a hyperlink. The name of the link is ‘*<filename>.<page number>*’. The filename extension of *<filename>* *must not* be stripped. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `link=false`)

**linkname** Changes the default linkname created by the option **link**. Instead of *<filename>* the value of this option is used. E.g. `linkname=mylink` produces the linknames ‘*mylink.<page number>*’.

**thread** Combines inserted pages to an article thread. Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `thread=false`)

**threadname** Several threads are distinguished by their threadnames. By default the threadname is equal to the filename (plus filename extension), but it can be changed with this option. This is useful if the same file is inserted twice or more times and should not be combined to one single thread. Or the other way round if pages from different documents should be combined to one single thread. (Default: `threadname=<filename.ext>`)

**linktodoc** Lets the inserted pages be hyperlinks to the document from which they were extracted. Note that the PDF-Viewer will not find the file, if *<filename>* has not filename extension (.pdf). Either ‘true’ or ‘false’ (or no value, which is equivalent to ‘true’). (Default: `linktodoc=false`)