

The cpecmu document class for L^AT_EX 2_ε

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Abstract

This document class modifies the standard report class to conform with the requirements of the Department of Computer Engineering at Chiang Mai University for the layout of senior project reports. It is a modified version of Cornell University's cornell thesis class.

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1 Introduction

This document describes the \LaTeX 2_ε document class `cpecmu`, suitable¹ for the production of reports at the Department of Computer Engineering, Chiang Mai University. The latest version of this document class should be available at

<https://cpe.eng.cmu.ac.th/2013/download.php>

1.1 Usage

To use this document class, write

```
\documentclass{cpecmu}
```

at the beginning of your \LaTeX source file.

This document class can be used with `xelatex`.

1.2 Options and packages

<code>cpe</code>	The author can specify whether the document is to be typeset as a report for a CPE project
<code>isne</code>	with the <code>cpe</code> option, or a report for an ISNE project with the <code>isne</code> option. The default is <code>cpe</code> .
<code>project</code>	The author can then specify whether the document is to be typeset as a final project
<code>survey</code>	report with the <code>project</code> option, or a project survey report with the <code>survey</code> option. The default is <code>project</code> .
<code>draft</code>	Formally, all style options supported by the report document class are also supported
<code>twoside</code>	by the <code>cpecmu</code> class, although support for some options, like <code>twocolumn</code> , may be incom-
<code>11pt</code>	plete. The <code>draft</code> option causes the text to be formatted with “single” spacing instead of the
<code>12pt</code>	required 1.5-spacing. This may be of use in drafting, or for formatting private copies. For
	such purposes, the <code>twoside</code> option may also be of use, as well as <code>11pt</code> or <code>12pt</code> (when <code>draft</code>
	is used, the <code>10pt</code> is the default).
<code>final</code>	The final style option (which is the default) will produce the 1.5-spacing <code>12pt</code> document
<code>semifinal</code>	as required for the production of the archival copies of the report. The <code>10pt</code> and <code>11pt</code>

¹In the authors’ opinion, but with no guarantee that other users will agree. The authors shall not be liable for any consequence, good or bad, of other people’s use of this software.

options specify font sizes that are too small and will be overridden (and a warning will be issued to inform you of this) if used in conjunction with the final option. The semifinal is identical to final, except that it highlights all horizontal overflows with a black solid rule.

<code>\ifdraft</code>	The <code>\ifdraft</code> and <code>\iffinal</code> macros (which will always be the opposites of one another) may be used to check whether the draft/semifinal option or the final one is in effect.
<code>\iffinal</code>	
<code>\tocprelim</code>	The <code>\tocprelim</code> option causes the preliminary sections to be listed in the table of contents, and the <code>\notocprelim</code> prevents the preliminary sections from being listed in the table of contents. By default, preliminary sections are listed in the table of contents.
<code>\notocprelim</code>	
<code>\smallerheadings</code>	A new option (now the default) <code>\smallerheadings</code> reduces the size of the normally-huge LaTeX headings to something more reasonable. <code>\normalsizeheadings</code> is used to select the conventional LaTeX chapter and heading sizes.
<code>\normalsizeheadings</code>	
<code>\glossary</code>	The <code>\glossary</code> option enables the glossary pages following the body of the report.
	The options should be specified as optional arguments to the <code>\documentclass</code> command.

1.3 Sample report

A sample thesis document, named `sampleReport.tex`, is included with the distribution of this document class. This is a good starting point for writing the report.

2 Arrangement of contents

A report must contain the following parts, in the order listed. Only parts explicitly designated as optional may be omitted. The current version of this file does not support all of the optional parts.

1. title page (in Thai for CPE, in English for ISNE)
2. title page (in English for CPE, in Thai for ISNE)
3. signature page
4. abstract (in Thai) (full report only)
5. abstract (in English) (full report only)
6. dedication (*optional*)
7. acknowledgments (full report only)
8. table of contents
9. list of figures (or list of illustrations) (full report only)
10. list of tables (full report only)
11. list of abbreviations (*optional*)
12. list of symbols (*optional*)

13. preface (*optional*)
14. text
15. references
16. appendix (or appendices) (full report only)
17. glossary (*optional*)
18. index (*optional*)
19. biographical sketch (full report only)

Some macros and environments are provided to ease the formatting of these parts.

2.1 Title pages

The title pages are produced by the standard L^AT_EX macro `\maketitle`, with no arguments. Prior to invoking it, you should declare the project number with the `\projectNo` macro; the title of the document in Thai with the `\titleTH` macro and in English with `\titleEN` macro; your name (exactly as registered with the University) and student identification number with the `\author` macro; and the academic year of the project with the `\acadyear` macro. The syntax of `\author` macro is

`\author{<Thai name>}{<English name>}{<student ID>}`

The syntax of `\acadyear` macro is

`\acadyear{<year-in-AD (e.g., 2020)>}`

For projects done by more than one student, simply repeat the `\author` macro with different values.

2.2 Signature page

The signature page is produced by the `\makesignature` macro, with no arguments. Prior to invoking it, you should declare the project advisor with the `\cpeadvisor` macro; and the project committee, one member at a time, with the `\cpecommittee` or `\committee` macro. The syntax of `\cpeadvisor` macro is

`\cpeadvisor{<advisor's first name in English, all lowercase>}`

The syntax of `\cpecommittee` macro is

`\cpecommittee{<committee member's first name in English, all lowercase>}`

The syntax of `\acadyear` macro, used for external committee members, is

`\committee{<Thai name>}{<English name>}`

The order of the committee members is the order of names given in the document.

2.3 Abstract page(s)

`abstractTH` The `abstractTH` and `abstract` environments are to be filled with the abstract of the project, in Thai and in English.

2.4 Dedication

`dedication` The format of the dedication is essentially free, but you may want to use the `dedication` environment for this purpose. This environment will center the text of your dedication vertically on the page. The dedication is optional.

2.5 Acknowledgments

`acknowledgments` An environment `acknowledgments` is provided for the acknowledgments section.

2.6 Table of Contents, List of Figures, List of Tables

`\contentspage` Use the macros `\contentspage`, `\figurelistpage`, and `\tablelistpage`, in this order, to produce the required table of contents and lists of figures and tables.
`\figurelistpage`
`\tablelistpage`

2.7 List of Abbreviations, List of Symbols, Preface

`\abbrlist` These sections are optional. Macros `\abbrlist`, `\symlist`, and `\preface` should be invoked to indicate the beginning of each of these sections. These macros act much like `\chapter*`, which they invoke. The main difference is that if the `tocprelim` option is used, entries will be made into the table of contents.
`\symlist`
`\preface`

2.8 Text

You should begin the text section of the report (normally divided into chapters) with the following commands:

```
\normalspacing
\setcounter{page}{1}
\pagenumbering{arabic}
\pagestyle{cpecmu}
```

The last of these commands controls the way pages are numbered throughout the text, ensuring that page numbers are placed at the bottom of the page, centered between the margins.

`plan` In the introduction chapter of your report, you should use the `plan` environment to generate the Gantt chart describing your project plan. For each task in your plan, you should use the `\planitem` macro to generate each row. The syntax of `\planitem` macro is
`\planitem`

```
\planitem{<start month (1-12)>}{<start year (in AD)>}{<end month (1-12)>}{<end year (in AD)>}{<task description>}
```

2.9 Bibliography

`thebibliography` Use the `thebibliography` environment to generate the bibliography. Or have `BIBTEX` do the work for you. The `cpecmu` document class modifies this environment slightly. You probably shouldn't use the `openbib` option for production of the archival copies of your report.

`\bibname` The default name for this section is **References**. You may change it by changing the expansion of `\bibname`, as in

```
\renewcommand{\bibname}{Bibliography}
```

2.10 Appendix

`\appendix` As in the report style, use the `\appendix` macro to mark the end of the last ordinary chapter and the start of the appendices. Then use a new `\chapter{<title>}` to start each appendix. Appendices will automatically be “numbered” alphabetically.

2.11 Glossary, Index

`\glossarypage` These sections are optional. Macros `\glossarypage` and `\indexpage` should be invoked
`\indexpage` to indicate the beginning of each of these sections.

2.12 Biographical sketch

`biosketch` A special environment `biosketch` is provided for the biographical sketch.

3 Configurable parameters

3.1 Interline spacing

The report is 1.5-spaced by default. If you want to modify the spacings, use the
`\changespacing` `\changespacing` macro. For example,

```
\changespacing{\normalspacing}{1}
```

will cause everything to be single spaced, while

```
\changespacing{\singlespacing}{2}
```

will cause everything to be double spaced, even the text within footnotes and bibliography entries which is normally single spaced.

`\singlespacing` The `\singlespacing` macro switches to single interline spacing. This can be useful within long tables that don't otherwise fit on a page. This is not true single spacing, which has six lines per inch (12 points apart) and appears too dense. Rather, it is single spacing as the `LATEX` article class understands it, with lines 14.5 points apart.

`\doublespacing` The `\doublespacing` macro switches to double spacing between lines, with six lines per inch and 24 points between lines. This is not double spacing as `LATEX` typically understands it, but rather as the rest of the world does.

<code>\normalspacing</code>	The <code>\normalspacing</code> macro restores normal interline spacing, whatever that is (<code>\singlespacingplus</code> by default).
<code>\footnotespacing</code>	The <code>\footnotespacing</code> macro switches to footnote spacing. This is equivalent to <code>\singlespacing</code> by default, but you may want to redefine this with, <i>e.g.</i> , <code>\renewcommand{\footnotespacing}{\doublespacing}</code>
<code>\singlespacingplus</code> <code>\realsinglespacing</code> <code>\realdoublespacing</code> <code>\listspacing</code>	Four other macros are provided to set potentially useful line spacings. Ordinarily you should not need to use any of these macros. <code>\singlespacingplus</code> sets 1.5-spacing, while <code>\realsinglespacing</code> sets real six-lines-per-inch spacing. The <code>\realdoublespacing</code> macro has the same effect as the <code>\doublespacing</code> macro and is included for backward compatibility with old versions of this document class. <code>\listspacing</code> sets the spacing between lines in various list-like sections of the thesis, such as the table of contents and the lists of tables and figures. By default it is the same as <code>\singlespacing</code> .

3.2 Font sizes

<code>\titlesize</code>	The <code>\titlesize</code> macro lets you change the font size used for the title of your report on the title page, should the default be unsuitable for any reason. For example, you could do <code>\titlesize{\LARGE}</code>
<code>\authorsize</code>	Similarly, the <code>\authorsize</code> macro lets you change the size of font used to print the author's name.

4 Internals

```

1 <class>\NeedsTeXFormat{LaTeX2e}[2020/02/02]
2 <class>\ProvidesClass{cpecmu}
3 [2020/05/13 v0.1.0
4 <class> Computer Engineering, Chiang Mai University senior report class]
```

4.1 Driver for this document

The docstrip program will extract the following driver from this file:

```

5 <*driver>
6 \documentclass{ltxdoc}
7 \usepackage[english]{thaixelatex}
8 \EnableCrossrefs
9 %\DisableCrossrefs % Say \DisableCrossrefs if index is ready
10 \RecordChanges
11 %\OnlyDescription % Comment out for implementation details
12 \CodelineIndex
13 \begin{document}
14   \DocInput{cpecmu.dtx}
15 %   \PrintIndex
16   \PrintChanges
17 \end{document}
18 </driver>
```

4.2 Option processing

First we set up conditionals to determine whether this is a CPE or ISNE report, and use CPE by default.

```
19 \newif\ifcpe
20 \DeclareOption{cpe}{\cpetrue}
21 \DeclareOption{isne}{\cpefalse}
22 \ExecuteOptions{cpe}
```

Next, we set up conditionals to determine whether this is a full or survey report, and use full report by default.

```
23 \newif\ifproject
24 \DeclareOption{project}{\projecttrue}
25 \DeclareOption{survey}{\projectfalse}
26 \ExecuteOptions{project}
```

The font size is mandated to be 12pt. If final is set, we override options 10pt and 11pt with a warning.

```
27 \DeclareOption{10pt}{%
28   \iffinal%
29   \OptionNotUsed%
30   \ClassWarningNoLine{cpecmu}{Font size 10pt not allowed; using 12pt}%
31   \else%
32   \PassOptionsToClass{10pt}{report}%
33   \fi%
34 }
35 \DeclareOption{11pt}{%
36   \iffinal%
37   \OptionNotUsed%
38   \ClassWarningNoLine{cpecmu}{Font size 11pt not allowed; using 12pt}%
39   \else%
40   \PassOptionsToClass{11pt}{report}%
41   \fi
42 }
```

We add options to include and exclude the preliminary sections in the table of contents. These are the options `tocprelim` and `notocprelim`. By default, the preliminary sections are included.

`\prelim@contents` Internally, macro `\prelim@contents` is called with the title of the section as an argument to generate the table of contents entry. By default, this macro invokes `\addcontentsline`; with the `notocprelim` option it is changed to do nothing. Preliminary sections are treated as sections, not chapters, for the table of contents.

```
43 \newcommand{\prelim@contents}[2][section]{\addcontentsline{toc}{#1}{#2}}
44 \DeclareOption{tocprelim}{%
45   % included for backwards compatibility only.
46 }
47 \DeclareOption{notocprelim}{%
48   \renewcommand{\prelim@contents}[1]{%
49 }
```



```
50 \providecommand\phantomsection{}
```

Define the draft, semifinal and final options that create the `\iffinal` and `\ifdraft` macros.

```
51 \DeclareOption{draft}{%
52   \let\ifdraft\iftrue%
53   \let\iffinal\iffalse%
54 }
55 \DeclareOption{final}{%
56   \let\ifdraft\iffalse%
57   \let\iffinal\iftrue%
58 }
59 \DeclareOption{semifinal}{%
60   \let\ifdraft\iftrue%
61   \let\iffinal\iffalse%
62   \PassOptionsToClass{draft}{report}%
63 }
```

Define the glossary option to enable glossary.

```
64 \newif\ifglossary\glossaryfalse
65 \DeclareOption{glossary}{\glossarytrue}
```

Define the idx option to enable index.

```
66 \newif\ifindex\indexfalse
67 \DeclareOption{idx}{\indextrue}
```

We pass all remaining options to the standard report class.

```
68 \DeclareOption*{%
69   \PassOptionsToClass{\CurrentOption}{report}%
70 }
```

All options must be processed now, so that we can load the report class right away.

```
71 \ExecuteOptions{final}
72 \ProcessOptions
```

4.3 Report class

We now load the report class, forcing the 12pt option as noted above. We then set A4 as the paper size.

```
73 \iffinal%
74   \PassOptionsToClass{12pt}{report}%
75 \fi
76 \PassOptionsToClass{a4paper}{report}%
77 \LoadClass{report}[2019/12/20]%
```

We now apply our modifications to the standard report class.

4.4 Chapter headings

We modify the commands which output the chapter headings.

```
\@makechapterhead
\@makeschapterhead
```

```

78 \def\@makechapterhead#1{%
79   \begin{center}%
80     \singlespacing
81     \@titlesize\bfseries
82     \@chapapp\space \thechapter \\\
83     #1
84   \end{center}%
85   \par\nobreak
86 }
87 \def\@makeschapterhead#1{%
88   \begin{center}%
89     \@titlesize\bfseries #1
90   \end{center}%
91   \par\nobreak
92 }

```

For CPE reports, set appendix number to be the Thai characters.

```

93 \ifcpe
94   \renewcommand\appendix{\par
95     \cleardoublepage
96     \thispagestyle{empty}
97     \vspace*{\fill}
98     \begin{center}
99       \huge\bf\appendixname
100      \vspace*{1in}
101     \end{center}
102     \vspace*{\fill}
103     \cleardoublepage
104     \setcounter{chapter}{0}%
105     \setcounter{section}{0}%
106     \gdef\@chapapp{\appendixname}%
107     \gdef\thechapter{\@thaiAlph{cchapter}}
108 \fi

```

4.5 Footnotes

Footnotes should be the same size as the main text.

```
109 \renewcommand{\footnotesize}{\normalsize}
```

They can be single spaced.

\@makefn_{text} We redefine the standard macro \@makefn_{text} to use \footnotespacing (defined below as \singlespacing, but modifiable by the user) and to restore \normalspacing afterwards.

```

110 \renewcommand{\@makefntext}[1]{%
111   \parindent 1em%
112   \noindent
113   \footnotespacing
114   \hbox to 1.8em{\hss\@makefnmark}#1

```

```

115 \par\normalspacing
116 }

```

4.6 Subscripts

Subscripts should be made larger than the default, just to be on the safe side.

```

117 \renewcommand{\defaultscriptratio}{.75}
118 \renewcommand{\defaultscriptscriptratio}{.6}

```

4.7 Page layout

The interior margin must be increased to at least 1.5 inches. Various other page layout parameters are reset here.

This part of the code may not be very robust when twocolumn is used. (No attempt has yet been made to get the margins right in that case.) But then, reports really shouldn't use twocolumn.

```

119 \setlength\headsep{25\p@}
120 \if@twocolumn
121 \else
122 \setlength\topmargin{-0.4in}
123 \setlength\headheight{0.16667in}
124 \setlength\headsep{0.33333in}
125 \setlength\textheight{9.4in}
126 \setlength\footskip{0.5in}
127 \setlength\oddsidemargin{.5in}
128 \setlength\evensidemargin{0in}
129 \setlength\textwidth{5.8in}
130 \setlength\marginparsep{0.1in}
131 \setlength\marginparwidth{0.8in}
132 \fi

```

4.8 Page styles

\ps@cpecmu We define a cpecmu page style. This has page numbers centered at the bottom of each page.

```

133 \newcommand{\ps@cpecmu}{%
134 \def\@oddhead{}
135 \def\@oddfoot{\hfil\thepage\hfil}%
136 \def\@evenhead{}%
137 \def\@evenfoot{\@oddfoot}%
138 \def\chaptermark##1{}%
139 \def\sectionmark##1{}%
140 }

```

We prefer predictable interline spacing over fixed page length. Thus:

```

141 \raggedbottom

```

Individual users are free to override this by using \flushbottom in the preamble.

4.9 Section names

The \LaTeX default section names are acceptable, except for the table of contents which must be called “Table of Contents”, not just “Contents”. $\text{\LaTeX} 2_{\epsilon}$ conveniently provides a macro to configure this.

```
142 \renewcommand{\contentsname}{Table of Contents}
```

$\text{\LaTeX} 2_{\epsilon}$ also provides `\bibname`, `\listtablename`, `\listfigurename`; the default values are adequate for our purposes.

Preliminary sections are handled here.

```
143 \newcommand{\@titlesize}{\fontsize{14}{18}\selectfont}
144 \newcommand{\@subtitlesize}{\fontsize{12}{24}\selectfont}
145 \newcommand{\@authorsize}{\@titlesize}
146 \newcommand{\titlesize}[1]{\renewcommand{\@titlesize}{#1}}
147 \newcommand{\subtitlesize}[1]{\renewcommand{\@subtitlesize}{#1}}
148 \newcommand{\authorsize}[1]{\renewcommand{\@authorsize}{#1}}
149
150 \newcommand{\@projectNo}{??}
151 \newcommand{\projectNo}[1]{\renewcommand{\@projectNo}{#1}}
152
153 \newcommand{\@titleTH}{ชื่อโครงการ}
154 \newcommand{\@titleEN}{Project Name}
155 \newcommand{\titleTH}[1]{\renewcommand{\@titleTH}{#1}}
156 \newcommand{\titleEN}[1]{\renewcommand{\@titleEN}{#1}}
157
158 \newcounter{@numauthors}\setcounter{@numauthors}{0}
159 \renewcommand{\author}[3]{%
160   \stepcounter{@numauthors}%
161   \expandafter\gdef
162     \csname @authorTH@romannumeral\number\value{@numauthors}\endcsname
163     {#1}%
164   \expandafter\gdef
165     \csname @authorEN@romannumeral\number\value{@numauthors}\endcsname
166     {#2}%
167   \expandafter\gdef
168     \csname @studentID@romannumeral\number\value{@numauthors}\endcsname
169     {#3}%
170 }
171 \newif\if@printid\@printidtrue
172 \newcounter{@authorIdx}
173 \def\@listauthors#1#2#3{%
174   \stepcounter{@authorIdx}%
175   \csname @author#1@romannumeral\number\value{@authorIdx}\endcsname%
176   #2%
177   \if@printid%
178     \csname @studentID@romannumeral\number\value{@authorIdx}\endcsname%
179   \fi
180   \ifnum\value{@authorIdx}<\value{@numauthors}%
181     #3%
182     \@listauthors{#1}{#2}{#3}%

```

```

183 \fi
184 }
185 \newcommand{\@authorsTH}[2]{%
186 \setcounter{@authorIdx}{0}%
187 \@listauthors{TH}{#1}{#2}%
188 }
189 \newcommand{\@authorsEN}[2]{%
190 \setcounter{@authorIdx}{0}%
191 \@listauthors{EN}{#1}{#2}%
192 }
193
194 \newcommand{\@acadyearBE}{2563}
195 \newcommand{\@acadyearAD}{2020}
196 \newcounter{@acadyear}
197 \newcommand{\@acadyear}[1]{%
198 \renewcommand{\@acadyearAD}{#1}
199 \setcounter{@acadyear}{#1}
200 \addtocounter{@acadyear}{543}
201 \renewcommand{\@acadyearBE}{\the@acadyear}
202 }
203 \newcommand{\@degreefieldAbbrTH}{\ifcpe วศ.คพ.\else วศ.ศค.\fi}
204 \newcommand{\@degreefieldAbbrEN}{\ifcpe CPE\else ISNE\fi}
205 \newcommand{\@degreefieldTH}{%
206 \ifcpe%
207     วิศวกรรมคอมพิวเตอร์%
208 \else%
209     วิศวกรรมระบบสารสนเทศและเครือข่าย%
210 \fi%
211 }
212 \newcommand{\@degreefieldEN}{%
213 \ifcpe%
214     Computer Engineering%
215 \else%
216     Information Systems and Network Engineering%
217 \fi%
218 }

Title page

219 \ifcpe%
220 \RequirePackage{thaixelatex}
221 \else%
222 \RequirePackage[english]{thaixelatex}
223 \fi
224 \newcommand{\@maketitleTH}{%
225 \begin{titlepage}%
226 \begin{center}%
227 \hrule height 0.5in width 0pt % force vertical space at top
228 \@titlesize\bf
229 โครงการงานเลขที่ \@degreefieldAbbrTH~\@projectNo/\@acadyearBE
230 \par\vspace*{0.5in}\par

```

```

231   เรื่อง
232   \par\vspace*{0.5in}\par
233   \@titleTH
234   \par\vspace*{0.75in}\par
235   โดย
236   \par\vspace*{0.75in}\par
237   {\@authorsize\@authorsTH{\quad รหัส~}{\\}}
238   \vfill
239   \ifproject%
240       โครงการนี้ \\
241       เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรบัณฑิต \\
242   \else%
243       รายงานนี้เป็นส่วนหนึ่งของวิชาสำรวจเพื่อโครงการ \\
244       ตามหลักสูตรปริญญาวิศวกรรมศาสตรบัณฑิต \\
245   \fi
246   ภาควิชาวิศวกรรมคอมพิวเตอร์ \\
247   คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเชียงใหม่ \\
248   ปีการศึกษา~\@acadyearBE
249   \end{center}
250   \vspace{0.25in}
251   \end{titlepage}
252 }
253 \newcommand{\@maketitleEN}{%
254   \begin{titlepage}%
255     \begin{center}%
256       \hrule height 0.5in width 0pt % force vertical space at top
257       \@titlesize\bf
258       PROJECT No. \@degreefieldAbbrEN~\@projectNo/\@acadyearBE
259       \par\vspace*{1in}\par
260       \@titleEN
261       \par\vspace*{1.5in}\par
262       {\@authorsize\@authorsEN{\quad}}{\\}}
263       \vfill
264       \ifproject%
265         A Project Submitted in Partial Fulfillment of Requirements \\
266         for the Degree of Bachelor of Engineering \\
267       \else%
268         A Report Submitted in Partial Fulfillment of Project Survey Course \\
269         as Required by the Degree of Bachelor of Engineering \\
270       \fi
271       Department of Computer Engineering \\
272       Faculty of Engineering \\
273       Chiang Mai University \\
274       \@acadyearAD
275     \end{center}
276     \vspace{0.25in}
277   \end{titlepage}
278 }
279 \renewcommand{\maketitle}{%
280   \typeout{Title page}

```

```

281 \pagenumbering{roman} % title page is counted but not numbered
282 \pagestyle{empty}
283 \ifcpe%
284   \@maketitleTH
285   \@maketitleEN
286 \else
287   \@maketitleEN
288   \@maketitleTH
289 \fi
290 }
291
292 \renewenvironment{titlepage}{%
293   \singlespacing
294 }{%
295   \normalspacing\clearpage
296 }

```

Signature page

```

297 \newcommand\cpefaculty[3]{%
298   \expandafter\gdef\csname @cpefacultyTH@#1\endcsname{#2}%
299   \expandafter\gdef\csname @cpefacultyEN@#1\endcsname{#3}%
300 }
301 \newcommand\deptChair[1]{
302   \ifundefined{@cpefacultyTH@#1}
303   {\ClassWarningNoLine{cpecmu}{Unknown CPE faculty: #1}}{%
304     \gdef\deptChairTH{\csname @cpefacultyTH@#1\endcsname}%
305     \gdef\deptChairEN{\csname @cpefacultyEN@#1\endcsname}%
306   }
307 }
308 \RequirePackage{cpecmu-faculty}
309
310 \newcommand{\@advisorTH}{(waiting for an advisor)}
311 \newcommand{\@advisorEN}{(waiting for an advisor)}
312 \newcommand\advisor[2]{%
313   \gdef\@advisorTH{#1}%
314   \gdef\@advisorEN{#2}%
315 }
316 \newcommand\cpeadvisor[1]{%
317   \ifundefined{@cpefacultyTH@#1}
318   {\ClassWarningNoLine{cpecmu}{Unknown CPE faculty: #1}}
319   {\advisor
320     {\csname @cpefacultyTH@#1\endcsname}
321     {\csname @cpefacultyEN@#1\endcsname}
322   }
323 }
324 \newcounter{@numcommittee}\setcounter{@numcommittee}{0}
325 \newcommand{\committee}[2]{%
326   \stepcounter{@numcommittee}%
327   \expandafter\gdef
328     \csname @committeeTH@romannumeral\number\value{@numcommittee}\endcsname

```

```

329     {#1}%
330 \expandafter\gdef
331   \csname @committeeEN@romannumeral\number\value{@numcommittee}\endcsname
332     {#2}%
333 }
334 \newcommand\cpecommittee[1]{%
335   \ifundefined{@cpefacultyTH@#1}
336   {\ClassWarningNoLine[cpecmu]{Unknown CPE faculty: #1}}
337   {\committee
338     {\csname @cpefacultyTH@#1\endcsname}
339     {\csname @cpefacultyEN@#1\endcsname}
340   }
341 }
342 \newcounter{@committeeIdx}
343 \def\@listcommittee#1#2#3{%
344   \stepcounter{@committeeIdx}%
345   #2%
346   \csname @committee#1@romannumeral\number\value{@committeeIdx}\endcsname%
347   #3%
348   \ifnum\value{@committeeIdx}<\value{@numcommittee}%
349     \@listcommittee{#1}{#2}{#3}%
350   \fi
351 }
352
353 \RequirePackage{tabularx}
354 \RequirePackage{ulem}
355 \newcommand{\@summaryTH}{%
356   \setlength\parindent{0pt}
357   \begin{tabularx}{\linewidth}{@{}l@{\quad} }X@{}}
358     หัวข้อโครงการ & \@titleTH \\
359     & \@titleEN \\
360     โดย & \\
361     \begin{tabular}{t}{@{}ll@{}}
362       \@authorsTH& รหัส~{\}\\
363     \end{tabular}
364     \\
365     ภาควิชา & วิศวกรรมคอมพิวเตอร์ \\
366     อาจารย์ที่ปรึกษา & \@advisorTH \\
367     ประเมิน & วิศวกรรมศาสตรบัณฑิต \\
368     สาขา & \@degreefieldTH \\
369     ปีการศึกษา & \@acadyearBE
370   \end{tabularx}
371   \par\bigskip\par
372   \hrule height 2pt
373 }
374 \newcommand{\@summaryEN}{%
375   \setlength\parindent{0pt}
376   \begin{tabularx}{\linewidth}{@{}l@{\quad} }X@{}}
377     Project Title & \@titleEN \\
378     Name &

```



```

379 \begin{tabular}[t]{@{}ll@{}}
380 \@authorsEN{& }{\}
381 \end{tabular}
382 \\
383 Department & Computer Engineering \\
384 Project Advisor & \@advisorEN \\
385 Degree & Bachelor of Engineering \\
386 Program & \@degreefieldEN \\
387 Academic Year & \@acadyearAD
388 \end{tabularx}
389 \par\bigskip\par
390 \hrule height 2pt
391 }
392
393 \newcommand{\makesignature}{%
394 \cleardoublepage
395 \pagenumbering{\ifcpe thaialph\else alph\fi}
396 % make sure all the page numbers in the
397 % PDF document are unique, if PDF page
398 % numbers generated
399 \pagestyle{plain}
400 \setcounter{page}{1}
401 \bgroup
402 \ifcpe\@summaryTH\else\@summaryEN\fi%
403 \par\vspace*{1cm}\par
404 \ifcpe%
405 ภาควิชาวิศวกรรมคอมพิวเตอร์ คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเชียงใหม่  

406 ได้อนุมัติให้โครงการนี้เป็นส่วน\~หนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรบัณฑิต  

407 (สาขา\@degreefieldTH)
408 \else%
409 The Department of Computer Engineering, Faculty of Engineering,  

410 Chiang Mai University has approved this project to be part of the  

411 degree of Bachelor of Engineering (\@degreefieldEN)
412 \fi
413 \begin{flushright}
414 \begin{tabular}{@{}cl@{}}
415 \\[1cm]
416 \dotuline{\hspace*{3.5in}} &
417 \ifcpe หัวหน้าภาควิชาวิศวกรรมคอมพิวเตอร์\else Department chair\fi\\
418 (\ifcpe\@deptChairTH\else\@deptChairEN\fi)
419 \end{tabular}
420 \end{flushright}
421 \par\bigskip\par
422 \ifcpe คณะกรรมการสอบโครงการ\else Project examination committee:\fi
423 \begin{flushright}
424 \begin{tabular}{@{}cl@{}}
425 \\[1cm]
426 \dotuline{\hspace*{3.5in}} &
427 \ifcpe ประธานกรรมการ\else Main advisor / Chair\fi \\
428 (\ifcpe\@advisorTH\else\@advisorEN\fi)

```

```

429 \setcounter{@committeeIdx}{0}%
430 \@listcommittee{\ifcpe TH\else EN\fi}{\[\[1cm]
431 \dotuline{\hspace*{3.5in}} & \ifcpe กรรมการ\else Committee member\fi \[
432 {}
433 {})%
434 \end{tabular}
435 \end{flushright}
436 \egroup
437 }

```

Abstract page

```

438 \newcommand\@abstract@begin[2]{%
439 \cleardoublepage
440 \typeout{Abstract}
441 {\csname @summary#1\endcsname}%
442 \par\vspace*{5mm}\par
443 \phantomsection
444 \prelim@contents{#2}
445 \begin{center}%
446 \@titlesize\MakeUppercase{\bfseries #2}
447 \end{center}%
448 }
449 \newenvironment{abstractTH}{\@abstract@begin{TH}{บทคัดย่อ}}{\cleardoublepage}
450 \renewenvironment{abstract}{\@abstract@begin{EN}{Abstract}}{\cleardoublepage}

```

Dedication

```

451 \newenvironment{dedication}{%
452 \phantomsection
453 \prelim@contents{Dedication}
454 \null\vfill
455 \begin{center}
456 }{
457 \end{center}
458 \vfill\null
459 \clearpage
460 }

```

Acknowledgments

```

461 \newcommand\strmnth[1]{%
462 \ifcpe%
463 \ifcase#1%
464 \or ม.ค.% 1
465 \or ก.พ.% 2
466 \or มี.ค.% 3
467 \or เม.ย.% 4
468 \or พ.ค.% 5
469 \or มิ.ย.% 6
470 \or ก.ค.% 7
471 \or ส.ค.% 8
472 \or ก.ย.% 9
473 \or ต.ค.% 10

```

```

474 \or พ.ย.% 11
475 \or ธ.ค.% 12
476 \fi
477 \else%
478 \ifcase#1%
479 \or Jan% 1
480 \or Feb% 2
481 \or Mar% 3
482 \or Apr% 4
483 \or May% 5
484 \or Jun% 6
485 \or Jul% 7
486 \or Aug% 8
487 \or Sep% 9
488 \or Oct% 10
489 \or Nov% 11
490 \or Dec% 12
491 \fi
492 \fi
493 }

```

\strmonth{month} returns month spelled out in Thai

```

494 \newcommand\strmonth[1]{%
495 \ifcpe%
496 \ifcase#1%
497 \or มกราคม% 1
498 \or กุมภาพันธ์% 2
499 \or มีนาคม% 3
500 \or เมษายน% 4
501 \or พฤษภาคม% 5
502 \or มิถุนายน% 6
503 \or กรกฎาคม% 7
504 \or สิงหาคม% 8
505 \or กันยายน% 9
506 \or ตุลาคม% 10
507 \or พฤศจิกายน% 11
508 \or ธันวาคม% 12
509 \fi
510 \else%
511 \ifcase#1%
512 \or January% 1
513 \or February% 2
514 \or March% 3
515 \or April% 4
516 \or May% 5
517 \or June% 6
518 \or July% 7
519 \or August% 8
520 \or September% 9
521 \or October% 10

```

```

522 \or November% 11
523 \or December% 12
524 \fi
525 \fi
526 }
527 \newcommand\Day[3]{%
528 \setcounter{@plan@y}{#1}%
529 \ifcpe\addtocounter{@plan@y}{543}\fi%
530 #3 \strmonth{#2} \the@plan@y%
531 }
532 \newcommand\acksign[3]{%
533 \@printidfalse%
534 \setcounter{@authorIdx}{0}%
535 \bigskip\par\noindent%
536 \begin{tabularx}{\linewidth}{@{\hspace*{2.5in}}>{\centering}X@{}}
537 \@listauthors{\ifcpe TH\else EN\fi}{\{\}}
538 \Day{#1}{#2}{#3}
539 \end{tabularx}
540 \par%
541 \@printidtrue%
542 }
543 \newenvironment{acknowledgments}{%
544 \pagestyle{plain}
545 \chapter*{\ifcpe กิตติกรรมประกาศ\else Acknowledgments\fi}
546 \prelim@contents{\ifcpe กิตติกรรมประกาศ\else Acknowledgments\fi}
547 }{%
548 \clearpage
549 }

Table of contents, list of figures, list of tables

550 \newcommand{\contentspage}{%
551 \cleardoublepage
552 \pagestyle{plain}
553 \listspacing{toc}
554 \phantomsection
555 \prelim@contents{\contentsname}
556 \tableofcontents
557 \normalspacing
558 \clearpage
559 }
560
561 \newcommand{\figurelistpage}{%
562 \pagestyle{plain}
563 \listspacing{fig}
564 \phantomsection
565 \prelim@contents{\listfigurename}
566 \listoffigures
567 \normalspacing
568 \clearpage
569 }

```

```

570
571 \newcommand{\tablelistpage}{%
572   \pagestyle{plain}
573   \listspacing{tab}
574   \phantomsection
575   \prelim@contents{\listtablename}
576   \listoftables
577   \normalspacing
578   \clearpage
579 }

```

The following three sections are optional. We define macros to start new chapters, but that is all.

```

580 \newcommand{\abbrlist}{%
581   \pagestyle{plain}
582   \listspacing{abbr}
583   \chapter*{\ifcpe รายการคำย่อ\else List of Abbreviations\fi}
584   \prelim@contents{\ifcpe รายการคำย่อ\else List of Abbreviations\fi}
585 }
586
587 \newcommand{\symlist}{%
588   \pagestyle{plain}
589   \listspacing{sym}
590   \chapter*{\ifcpe รายการสัญลักษณ์\else List of Symbols\fi}
591   \prelim@contents{\ifcpe รายการสัญลักษณ์\else List of Symbols\fi}
592 }
593
594 \newcommand{\preface}{%
595   \pagestyle{plain}
596   \listspacing{pref}
597   \chapter*{\ifcpe คำนำ\else Preface\fi}
598   \prelim@contents{\ifcpe คำนำ\else Preface\fi}
599 }

```

Set up font size for section headings.

```

600 \RequirePackage{titlesec}
601 \titleformat*{\section}{\bfseries}
602 \titleformat*{\subsection}{\bfseries}
603 \titleformat*{\subsubsection}{\bfseries}

```

Command and environment for the work plan table.

```

604 \RequirePackage[final]{graphicx}
605 \RequirePackage[table,x11names]{xcolor}
606 \RequirePackage{rotating}
607
608 \newcounter{@plan@sm}
609 \newcounter{@plan@sy}
610 \newcounter{@plan@em}
611 \newcounter{@plan@ey}
612 \newcounter{@plan@m}
613 \newcounter{@plan@y}

```

```

614 \newcounter{@plan@colscount}
615 \newenvironment{plan}[4]{%
616   \setcounter{@plan@sm}{#1}
617   \setcounter{@plan@sy}{#2}
618   \setcounter{@plan@em}{#3}
619   \setcounter{@plan@ey}{#4}
620   \def\@plan@numcols{%
621     \stepcounter{@plan@colscount}
622     \ifnum\value{@plan@y}=\value{@plan@ey}%
623       \ifnum\value{@plan@m}<\value{@plan@em}%
624         \stepcounter{@plan@m}%
625         \@plan@numcols%
626       \fi
627     \else%
628       \stepcounter{@plan@m}%
629       \ifnum\value{@plan@m}=13%
630         \stepcounter{@plan@y}%
631         \setcounter{@plan@m}{1}%
632       \fi
633     \@plan@numcols%
634   \fi
635 }
636 \def\@plan@genheader{%
637   &
638   \begin{sideways}
639     \ifcpe\addtocounter{@plan@y}{543}\fi
640     \strmnth{\value{@plan@m}} \the@plan@y\hspace*{1ex}%
641     \ifcpe\addtocounter{@plan@y}{-543}\fi
642   \end{sideways}
643   \ifnum\value{@plan@y}=\value{@plan@ey}%
644     \ifnum\value{@plan@m}<\value{@plan@em}%
645       \stepcounter{@plan@m}%
646       \@plan@genheader%
647     \fi
648   \else%
649     \stepcounter{@plan@m}%
650     \ifnum\value{@plan@m}=13%
651       \stepcounter{@plan@y}%
652       \setcounter{@plan@m}{1}%
653     \fi
654     \@plan@genheader%
655   \fi
656 }
657 \setcounter{@plan@m}{\value{@plan@sm}}
658 \setcounter{@plan@y}{\value{@plan@sy}}
659 \setcounter{@plan@colscount}{0}
660 \@plan@numcols
661 \tabularx{\linewidth}{|X|*{\the@plan@colscount}{c|}}
662 \hline
663 \bf\ifcpe ขั้นตอนการดำเนินงาน\else Task\fi

```

```

664 \setcounter{@plan@m}{\value{@plan@sm}}
665 \setcounter{@plan@y}{\value{@plan@sy}}
666 \@plan@genheader
667 \\\hline
668 }{%
669 \endtabularx
670 }
671 \newcommand\planitem[6][gray]{%
672 \gdef\@plan@paint{%
673 &
674 \ifnum\value{@plan@y}<#3\else%
675 \ifnum#3=\value{@plan@y}%
676 % sy = y
677 \ifnum#5<\value{@plan@y}\else%
678 \ifnum\value{@plan@y}=#5%
679 % sy = y = ey
680 \ifnum\value{@plan@m}<#2\else%
681 \ifnum#4<\value{@plan@m}\else%
682 % sm <= m <= em
683 \cellcolor{#1}
684 \fi
685 \fi
686 \else%
687 % sy = y < ey
688 \ifnum\value{@plan@m}<#2\else%
689 % sm <= m
690 \cellcolor{#1}
691 \fi
692 \fi
693 \fi
694 \else
695 % sy < y
696 \ifnum#5<\value{@plan@y}\else%
697 \ifnum\value{@plan@y}=#5%
698 % sy < y = ey
699 \ifnum#4<\value{@plan@m}\else%
700 % m <= em
701 \cellcolor{#1}
702 \fi
703 \else%
704 % sy < y < ey
705 \cellcolor{#1}
706 \fi
707 \fi
708 \fi
709 \fi
710 \ifnum\value{@plan@y}=\value{@plan@ey}%
711 \ifnum\value{@plan@m}<\value{@plan@em}%
712 \stepcounter{@plan@m}%
713 \@plan@paint%

```

```

714     \fi
715     \else%
716         \stepcounter{@plan@m}%
717         \ifnum\value{@plan@m}=13%
718             \stepcounter{@plan@y}%
719             \setcounter{@plan@m}{1}%
720         \fi
721         \@plan@paint%
722     \fi
723 }
724 #6%
725 \setcounter{@plan@m}{\value{@plan@sm}}
726 \setcounter{@plan@y}{\value{@plan@sy}}
727 \@plan@paint%
728 \\\hline
729 }

    Bibliography section
730 \addto\captionsenglish{%
731     \renewcommand{\bibname}{References}%
732 }
733 \let\cpecmu@bibliography=\bibliography
734 \def\bibliography#1{%
735     \cleardoublepage
736     \listspacing{bib}
737     \phantomsection
738     \prelim@contents[chapter]{\bibname}
739     \cpecmu@bibliography{#1}
740 }

    Biographical sketch
741 \newenvironment{biosketch}{%
742     \typeout{Vita}
743     \chapter*{\ifcpe ประวัติผู้เขียน\else Biographical Sketch\fi}
744     \prelim@contents[chapter]{\ifcpe ประวัติผู้เขียน\else Biographical Sketch\fi}
745 }{%
746     \clearpage
747 }
748 \AtBeginDocument{%
749     \let\cpecmu@thebibliography=\thebibliography
750     \renewcommand\thebibliography[1]{%
751         \cpecmu@thebibliography{#1}%
752         \setlength{\itemsep}{18pt}%
753         \setlength{\parsep}{0pt}%
754         \setlength{\parskip}{0pt}%
755     }%
756 }

```

The glossary and index sections are optional. Package glossaries is required for generating the glossary. Package makeidx is required for generating the index.

```

757 \ifglossary

```



```

758 \RequirePackage[toc,numberline]{glossaries}
759 \makeglossaries
760
761 \newcommand{\glossarypage}{%
762   \pagestyle{plain}
763   \listspacing{glossary}
764   \printglossaries
765 }
766 \else
767 \newcommand\gls[1]{#1}
768 \fi
769
770 \ifindex
771 \RequirePackage{makeidx}
772 \makeindex
773
774 \newcommand{\indexpage}{%
775   \pagestyle{plain}
776   \listspacing{index}
777   \printindex
778 }
779 \else
780 \renewcommand\index[1]{}
781 \fi

```

This sets up the interline spacing for normal text, small text, and footnote text, and defines the various spacing macros. Because the interline spacing for normal text is set to 12 points, the spacing macros can do the straightforward thing, except for \singlespacing, which tries to be backward compatible with article.

```

782 \renewcommand\normalsize{%
783   \@setfontsize\normalsize\@xipt{12}%
784   \abovedisplayskip 12\p@ \@plus3\p@ \@minus7\p@
785   \abovedisplayshortskip \z@ \@plus3\p@
786   \belowdisplayshortskip 6.5\p@ \@plus3.5\p@ \@minus3\p@
787   \def\@listi{\leftmargin\leftmargini
788     \parsep 5\p@ \@plus2.5\p@ \@minus\p@
789     \topsep 10\p@ \@plus4\p@ \@minus6\p@
790     \itemsep \z@ \@plus2.5\p@ \@minus\p@}%
791   \belowdisplayskip \abovedisplayskip
792 }
793 \renewcommand\small{%
794   \@setfontsize\small\@xipt{11}%
795   \abovedisplayskip 11\p@ \@plus3\p@ \@minus6\p@
796   \abovedisplayshortskip \z@ \@plus3\p@
797   \belowdisplayshortskip 6.5\p@ \@plus3.5\p@ \@minus3\p@
798   \def\@listi{\leftmargin\leftmargini
799     \topsep 9\p@ \@plus3\p@ \@minus5\p@
800     \parsep 4.5\p@ \@plus2\p@ \@minus\p@
801     \itemsep \z@ \@plus2\p@ \@minus\p@}%
802   \belowdisplayskip \abovedisplayskip

```

```

803 }
804 \renewcommand\footnotesize{%
805   \@setfontsize\footnotesize\@xpt\@xpt
806   \abovedisplayskip 10\p@ \@plus2\p@ \@minus5\p@
807   \abovedisplayshortskip \z@ \@plus3\p@
808   \belowdisplayshortskip 6\p@ \@plus3\p@ \@minus3\p@
809   \def\@listi{\leftmargin\leftmargini
810     \topsep 6\p@ \@plus2\p@ \@minus2\p@
811     \parsep 3\p@ \@plus2\p@ \@minus\p@
812     \itemsep \parsep}%
813   \belowdisplayskip \abovedisplayskip
814 }
815
816 \newcommand{\realsinglespacing}{%
817   \let\CS=\@currsize\renewcommand{\baselinestretch}{1.0}\CS}
818 \def\singlespacing{%
819   \let\CS=\@currsize\renewcommand{\baselinestretch}{1.208333}\CS}
820 \newcommand{\singlespacingplus}{%
821   \let\CS=\@currsize\renewcommand{\baselinestretch}{1.5}\CS}
822 \def\doublespacing{%
823   \let\CS=\@currsize\renewcommand{\baselinestretch}{2}\CS}
824 \newcommand{\realdoublespacing}{%
825   \let\CS=\@currsize\renewcommand{\baselinestretch}{2}\CS}
826 \newcommand{\normalspacing}{\singlespacingplus}
827 \newcommand{\footnotespacing}{\singlespacing}
828 \newcommand{\listspacing}[1] % extra arg is extensibility hook
829   {\singlespacing}
830 \newcommand{\changespacing}[2]{%
831   \renewcommand{#1}{%
832     \let\CS=\@currsize\renewcommand{\baselinestretch}{#2}\CS}%
833 }
834 % \ifdraft\changespacing{\normalspacing}{1}\fi
835 \newcommand{\changenormalspacing}[1]{\renewcommand{\normalspacing}{#1}}
836 \normalspacing
837
838 % redefine to do singlespacing
839 \def \@floatboxreset {%
840   \reset@font
841   \normalsize
842   \singlespacing
843   \@setminipage
844 }

```

End (for now)