

How to Use the L^AT_EX 2_ε Class File (ieej-e.cls) for the Transactions of the Institute of Electrical Engineers of Japan

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IEE Japan provides a L^AT_EX 2_ε class file, named ieej-e.cls, for the Transactions of the Institute of Electrical Engineers of Japan. This document describes how to use the class file, and also makes some remarks about typesetting a document by using L^AT_EX 2_ε. The design is based on L^AT_EX 2_ε.

Keywords: Class file, L^AT_EX 2_ε

1. Introduction

This document describes how to handle the ieej-e.cls for the Transactions of the Institute of Electrical Engineers of Japan. Section 2 explains how to typeset according to the template. template.tex which is distributed with the ieej-e.cls can be used. Section 3 describes a special feature of ieej-e.cls, which is different to the article.cls provided by the standard L^AT_EX 2_ε and which points may be aware of on writing a paper and so on. Section 4 is about typographic notes, which explains how to typeset, how to prevent typographic errors and how to handle long formulas. For information about printing on A4 paper and making pdf file, see Appendix (p.6).

2. Template and How to Typeset the Paper and Letter

2.1 Type of the Paper Here is the template of the paper.

```
\documentclass[english]{ieej-e}
\usepackage{graphicx}
\usepackage[varg]{txfonts}
\FIELD{A}
\YEAR{2011}
\NO{1}
\title[]{}
\authorlist{}
\authorentry{name}{membership}{label}
}
\affiliate[label]
{affiliate\ address}
\received{2011}{1}{23}
\revised{2011}{3}{15}
\begin{document}
\begin{abstract}
Summary
\end{abstract}
```

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```
\begin{keyword}
Keywords
\end{keyword}
\maketitle
\section{Introduction}
...
\begin{thebibliography}{99}
\bibitem{}
\bibitem{}
...
\end{thebibliography}
\appendix
\section{}
...
\acknowledgment
...
\begin{biography}
\profile{membership}{name}{text}
\end{biography}
\end{document}
```

- The txfonts package should be loaded.
\usepackage[varg]{txfonts}
Note that if you require amsmath packages, it must be specified before txfonts package.
- The \FIELD command is used for the footer. Its argument indicates the categories of IEEJ transactions (see Table 1 of “Author’s Guidelines for the Transactions of the Institute of Electrical Engineers of Japan”). For example, in the case of “Fundamental and Materials” A is specified as the argument of \FIELD.
- The \YEAR command is used for the footer. The year of publication is assigned as \YEAR{2011}.
- The \NO command is also used for the footer. The number of the issue is assigned as \NO{1}.
Those two commands are optional. If you do not know which issue your paper to be appear, they may be commented out or left blank.
- The title of a paper is assigned in \title. You may use \\ to start a new line in a long title.

The argument of the \title command is used for more than just producing a title, it is also used to generate a running head.

A shorter title should be specified within 8 words as follows.

`\title[short title]{title}`

- The outputs of authors' names, memberships and marks of affiliates are automatically generated by using the `\authorlist` and `\authorentropy` commands.

The `\authorentropy` command must be described as an argument of the `\authorlist` command.

The `\authorentropy` command has three arguments.

`\authorentropy{name}{membership}{label}`

For example, they could be typesetted as follows:

```
\authorlist{%
\authorentropy{Taro_Denshi}{m}{TRL}
\authorentropy{Hanako_Denki}{n}{KEC}
}
```

- The first argument of `\authorentropy` is filled with the author's name.
- The second argument is specified by one letter out of seven letters (m, a, s, l, n, h, S, f), each one indicating the membership of authors as the following table shows.

m	Member
a	Associate
s	Student Member
l	Life Member
n	Non-member
h	Honorary Member
S	Senior Member
f	Fellow

the left column is letters to be specified. the right column is membership to be generated.

No extra spaces may be added between a letter and a brace. `{m}` and `{m_}` are regarded as different. The latter will not generate "Member".

- The third argument is assigned by the label of the author's affiliate, corresponding to the label of the `\affiliate` command (see below). For example, an abbreviation for a university, institute or company can be given.

If an author does not have an affiliate, none must be specified.

- You might specify e-mail address as follows.

```
\authorentropy[TaroDenshi@iee.or.jp]
{Taro Denshi}{m}{TRL}
```

The following words are generated on the left side at the bottom of the first page.

"a) Correspondence to: TaroDenshi@iee.or.jp"

- The `\authorentropy` command lists the authors' names and affiliates one by one. If more than 10 authors are listed, the list occupies almost a half of the page. Therefore, if you specify as follows, `\def\authoralign{2}` then, it will list the names two per line. The argument of `\authoralign` must be 1 or 2.

- An author's affiliate is described in the `\affiliate` command as follows.

`\affiliate[label]{affiliate\address}`

The first argument "label" must be the same as the 3rd argument of the `\authorentropy` command. The second

argument is assigned by both the author's affiliate and address, which are separated by `\\`.

No extra spaces may be added between a letter and a brace in the first *label* argument. The entry of `\affiliate` must be followed by the order of labels in `\authorlist` commands.

- If the labels of `\affiliate` are different from those of `\authorentropy`, there will be a warning message on your terminal.
- Both the `\received` and `\revised` commands are used for the date of receipt and revision of the paper. For example, the date of receipt is assigned as `\received{2011}{1}{23}` and the date of revision is assigned as `\revised{2011}{3}{15}`.

Both commands will generate the following strings below authors' names.

"(Manuscript received January 23, 2011, revised March 15, 2011)"

- The text of the abstract is described in the `abstract` environment. The text should be a maximum of 150 to 200 words.

The text of the keywords is described in the `keyword` environment. The text should be a maximum of 6 words.

- The `\maketitle` command must come after those commands before the main text begins.
- The `\appendix` command of the standard $\text{\LaTeX} 2_{\epsilon}$ is a declaration that changes the way sectional units are numbered. But `\appendix` of `ieej-e.cls` generates the heading "Appendix" and appendix sections are numbered "1", "2", etc., appendix equation numbers are numbered "(A1)", "(A2)", etc., appendix figure numbers are numbered "app. Fig. 1", "app. Fig. 2", etc.
- The `\acknowledgment` command is available if you might express your gratitude.
- Authors' profile on page ?? is generated with:

```
\begin{biography}
\profile{m}{Denshi Taro}{%
was born in Kumamoto, Japan,
on August 15, 1972.
... }
\profile{n}{Denki Hanako}{%
was born in Okayama, Japan,
on February 25, 1960.
... }
\end{biography}
```

- The first argument of the `\profile` command is specified by one letter out of seven letters (m, a, s, l, n, h, S) the same as the second argument of `\authorentropy`.

The second and third arguments are filled with an author's name and profile respectively.

- If EPS (see p.3) files of pictures of the authors' faces are provided, put the EPS files named `a1.eps`, `a2.eps`, etc., which are followed by the order of authors, on the current directory of your computer (`a1.pdf` when compiling with `\usepackage[pdftex]{graphicx}`). The `\profile` command automatically reads their files and puts their pictures on the left margin.

The ratio of EPS file must be `width : height = 22`


```
\begin{figure}[tbp]
... floating materials ...
\capwidth=50mm
\caption{An example of caption
in English.}
\label{fig:1}
\end{figure}
```

Fig. 1. An example of caption in English.

Table 1. An example of table caption in English.

A	B	C
X	Y	Z

```
\begin{table}[b][tbp]
\caption{An example of table caption in English.}
\label{table:1}
\begin{center}
\begin{tabular}{c|c|c}
\hline
A & B & C\\
\hline
X & Y & Z\\
\hline
\end{tabular}
\end{center}
\end{table}
```

`\verbatimleftmargin=0pt`

`\def\verbatimsize{\normalsize}`

`\verbatimbaselineskip=\baselineskip`

The leftmargin of the verbatim environment is set 0pt. The font size is set `\normalsize`. The baselineskip is set the same of normal texts.

For example, those parameters can be changed as follows:

`\verbatimleftmargin=6.5mm`

`\def\verbatimsize{\footnotesize}`

`\verbatimbaselineskip=3mm`

3.6 Bibliography and Citations `ieej-e.cls` includes the `citesort.sty` with a little customized. The `citesort.sty` collapses a list of three or more consecutive numbers into a range, and sorts the numbers before collapsing them. For example, “(6) (7) (5) (2) (1) (3)” is transformed into “(1)~(3)~(5)~(7)”.

The `\cite` command displays citations as superscript numbers. To get “ref. (1)”, the `\Cite` command can be used.

In the `thebibliography` environment, place references in the right order according to the IEEJ editing style; e.g., authors’ names, initials, title of article, journal abbreviation, volume number, pages, and publication year. Journals are italicized as `\itshape`, and titles of papers enclosed with “ ” in plain text.

3.7 Make All Text Pages the Same Height

`\flushbottom` is declared in `ieej-e.cls`. It makes all text pages the same height, adding extra vertical space when necessary to fill out the page.

3.8 AMS Packages The $\mathcal{AMS}$ - $\text{\LaTeX}$ packages are provided to typeset complex equations or other mathematical constructions. If you would like to use them, the `amsmath` package should be loaded with the `fleqn` option.

`\usepackage[fleqn]{amsmath}`

When the `amsmath` package is loaded, many environments, for example the `equation`, `align`, `gather`, `multiline` and `split` environments etc., will not automatically generate dots between a formula and a formula number. One primitive

Table 2. `\FRAC` and `\RN`

<code>\RN{2}</code>	II
<code>\RN{117}</code>	CXVII
<code>\FRAC{\pi}{2}</code>	$\pi/2$
<code>\FRAC{1}{4}</code>	$1/4$

way to resolve this problem is to typeset as follows at the end of the formula.

`\rlap{\hbox to 10mm{\ \EqnDots}}`

This puts the leaders of width 10 mm into a box of width zero, extending to the right of the current position.

While the `amsmath` package presents many functions, only the `\boldsymbol` command which is to be used for individual bold math symbols and bold Greek letters is needed, only the `amsbsy` package should be loaded.

`\usepackage{amsbsy}`

When the `amssymb` package is loaded, many extra math symbols of the $\mathcal{AMS}$ - $\text{\LaTeX}$ fonts will become available⁽¹⁰⁾.

`\usepackage[psamsfonts]{amssymb}`

3.9 Miscellaneous

3.9.1 Macros Defined by `ieej-e.cls`

- `\QED`: Produces “□” in the end of the proof and so on. You would get the same output by using `\hfill $\Box$`. But if the end of a paragraph goes to the right margin, the character □ is positioned at the start of a line. Using `\QED` will prevent such cases.
- `\halflineskip` and `\onelineskip`: Produce a vertical space, $1/2\text{\baselineskip}$, $1\text{\baselineskip}$ respectively.
- As shown in Table 2, the macros `\RN` and `\FRAC` are defined⁽¹⁾.
- `\ddash`: Produce double “—”. double “---” sometimes produce thin space between two “—”. `\ddash` will prevent such a case.

4. Typographic Notes

4.1 How to Prevent Typographic Errors

- (1) You should pay attention to a space after a period. “ $\text{\TeX}$ simply assumes that a period ends a sentence unless it follows an uppercase letter. This works most of the time, but not always—abbreviations like ‘etc.’ being the most common exception. You tell $\text{\TeX}$ that a period doesn’t end a sentence by using a `\_` command (a `\_` character followed by a space or the end of a line) to make the space after the period.”
“On the rare occasions that a sentence-ending period follows an uppercase letter, you will have to tell $\text{\TeX}$ that the period ends the sentence. You do this by preceding the period with a `\@` command.”⁽⁹⁾
Beans (lima, etc.)_have vitamin B\@.
- (2) “Line breaking should be prevented at certain interword spaces. ... Trying `~` (a tilde character) produces an ordinary interword space at which $\text{\TeX}$ will never break a line.”⁽⁹⁾
Mr. ~Jones, Figure~\ref{fig:1}, (1)~gnats.
- (3) With respect to Figure, Section, Equation, when these words appear at the beginning of a sentence, they should be spelt out in full, e.g., “Figure 1 shows...” is used. When they appear in the middle of a sentence, abbreviations, e.g., “in Fig. 1”, “in Sect. 2”, “in Eq. 3”

should be used.

- (4) There should be no space after opening or before closing parentheses, as in (`\word`).
- (5) There are many cases of an inappropriate application of a `\` or `\newline` command except in the tabular environment etc., such as two `\` commands in succession or `\` command just before a blank line. They will often cause warning messages like Underfull `\hbox ...`, as a result it would often prevent you from finding important warning messages. The use of `\par\noindent` or `\hfil\break` commands is recommended and gives you the same effect without warning messages.
- (6) There are some cases of an inappropriate application of a `\` in descriptions such as program lists. Use of the `tabbing` environment or `list` environment is recommended.
- (7) The difference in the use of the hyphen (-), en dash (--) and em dash (---) should be noted. A hyphen is used in connecting English-language words such as ‘well-known’, and an en dash is used when expressing a range such as ‘pp.298–301’. The em dash is even longer—it’s used as punctuation.
- (8) The difference when hyphen and en dash are used in maths mode should also be noted. Some examples are given below.

$$A^{\mathrm{b}} \mathrm{mbox{-}c} \Rightarrow \text{hyphen}$$

$$A^{\mathrm{b}} \mathrm{mbox{--}c} \Rightarrow \text{en dash}$$

$$A^{\mathrm{b}-\mathrm{c}}$$

$$A^{b-c} \Rightarrow \text{minus sign}$$
- (9) The less-than sign “<” (<, a relation) should not be confused with “⟨” (\langle, a delimiter). The same is true for the greater-than sign “>” and “⟩”.
- (10) A unary operator and a binary operator: “+ or – that begins a formula (or certain subformulas) is assumed to be a unary operator, so typing `$-x$` produces $-x$ and typing `$$\sum - x_i$` produces $\sum -x_i$, with no space between the “-” and “ x ”. If the formula is part of a larger one that is being split across lines, TeX must be told that the + or – is a binary operator. This is done by starting the formula with an invisible first term, produced by an `\mbox` command with a null argument.”⁽⁹⁾

```
\begin{eqnarray}
y &=& a + b + c + \dots + e\\
&& \&\ \mbox{} + f + \dots
\end{eqnarray}
```
- (11) `\allowbreak` may be used within long maths formulas in paragraphs instead of using `\hfil\break`, `\` or `\linebreak`, since TeX is reluctant to break lines there.

4.2 How to Handle Long Formulas

Here are some explanations how to handle long formulas, for example, overhanged equations, equations overriding the equation number, and so forth.

Example 1:

$$y = a + b + c + d + e + f + g + h + i + j + k + l + m(2)$$

The equation is too long, and the space between the equation and the equation number are too narrow and sometimes the equation number moves to the right. In this case the `\!` command is useful.

“The \! acts like a backspace, removing the same space amount of space that \, adds.”⁽⁹⁾

```
\begin{equation}
y!=\!|a|+\!|b|+\!|c|+\!| \dots |+\!|m
\end{equation}
```

$$y=a+b+c+d+e+f+g+h+i+j+k+l+m\cdots\cdots\cdots (3)$$

Example 2: Using eqnarray environment instead of equation environment.

$$\begin{array}{l} y \text{ \& } a+b+c+d+e+f+g+h \backslash \text{nonnumber} \backslash \\ \text{ \& \& } \backslash \text{mbox} \{ \} +i+j+k+l+m+n+o \end{array}$$

To typeset above, you will get the following output.

$$y = a + b + c + d + e + f + g + h + i + j + k + l + m + n + o \dots\dots\dots (4)$$

Example 3: To change the value of `\mathindent` is to change the position that the equation begins[†].

```
\mathindent=0mm % <-- [1]
\begin{equation}
y=a+b+c+d+e+f+g+h+i+j+k+l+m
\end{equation}
\mathindent=6.5mm % <-- [2] default value
```

To typeset above (see [1]), you will get the following output.

$$y = a + b + c + d + e + f + g + h + i + j + k + l + m \cdots (5)$$

The value of `\mathindent` must be restored (see [2]).

Example 4:

$$\iint_S \left(\frac{\partial V}{\partial x} - \frac{\partial U}{\partial y} \right) dx dy = \oint_C \left(U \frac{dx}{ds} + V \frac{dy}{ds} \right) ds \dots (6)$$

The equation is too long and overrides the equation number. In this case the `\lefteqn` command is useful. It can be used for splitting long formulas across lines as follows.

$$\int_C \left(U \frac{\partial V}{\partial x} - \frac{\partial U}{\partial y} \right) dx dy$$

To typeset above, you will get the following output.

$$\begin{aligned} & \iint_S \left(\frac{\partial V}{\partial x} - \frac{\partial U}{\partial y} \right) dx dy \\ &= \oint_C \left(U \frac{dx}{ds} + V \frac{dy}{ds} \right) ds \dots\dots\dots (7) \end{aligned}$$

[†] This explanation is appropriate to left-aligns displayed formulas, not to centering formulas.

Example 5: A matrix using the `array` environment.

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix} \dots\dots\dots (8)$$

The width of a matrix can be shrunk by changing the value of `\arraycolsep` or using an `@`-expression (`@{}`).

```
\begin{equation}
\arraycolsep=3pt % <--- [1]
A = \left(
\begin{array}{@{\hspace{2pt}}% <-- [2]
cccc
@{\hspace{2pt}}% <-- [2]
}
a_{11} & a_{12} & \ldots & a_{1n} \\
a_{21} & a_{22} & \ldots & a_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{m1} & a_{m2} & \ldots & a_{mn} \\
\end{array}
\right)
\end{equation}
```

The `\arraycolsep` dimension is half the width of a horizontal space between columns in the `array` environment. A matrix using the `array` environment can be shrunk by changing the value of `\arraycolsep` (see [1]). And also it can be shrunk by using `@`-expression (see [2]).

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix} \dots\dots\dots (9)$$

Compare Eqs. (8) and (9).

Example 6: A matrix using a `\pmatrix`.

```
\begin{equation}
\def\quad{\hspace{.75em}\relax}% <-- [1]
%% default setting is \hspace{1em}
A = \pmatrix{
a_{11} & a_{12} & \ldots & a_{1n} \\
a_{21} & a_{22} & \ldots & a_{2n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{m1} & a_{m2} & \ldots & a_{mn} \\
}
\end{equation}
```

In the case of the equation using `\pmatrix`, the definition of `\quad` can be changed (see [1]).

If `amsmath` packages is loaded, the `\pmatrix` environment (`\begin{pmatrix}` and `\end{pmatrix}`) must be selected instead of `\pmatrix`. In that case the explanation on Example 5 is useful.

- (6) S. von Bechtolsheim: *T_EX in Practice*, Springer-Verlag (1993)
- (7) G. Grätzer: *Math into T_EX—A Simple Introduction to A_MS-*L*T_EX*, Birkhäuser (1993)
- (8) N. Walsh: *Making T_EX Work*, O'Reilly & Associates (1994)
- (9) L. Lamport, *L_AT_EX: A Document Preparation System*, Second Edition, Addison-Wesley (1994)
- (10) M. Goossens, F. Mittelbach & A. Samarin: *The L_AT_EX Companion*, Addison-Wesley (1994)
- (11) M. Goossens, S. Rahts, and F. Mittelbach: *The L_AT_EX Graphics Companion*, Addison-Wesley (1997)

Appendix

1. Printing on A4 paper and making pdf file

- If you print a manuscript on A4 paper by using `dvips` printer driver, the following parameter might be set.
`dvips -Pprinter -t a4 -O 0in,0in file.dvi`
printer is a name of printer. “-t a4 -O 0in,0in” option might be omitted.
- You can directly make a pdf file by using `pdflatex`, or convert a dvi file to a pdf file by using `dvips` and Acrobat Distiller or `dvipdfmx`.
- If you convert a dvi file to a pdf file, you must first convert a dvi file to a ps file (printer is your printer name):
`dvips -Pprinter -t a4 -O 0in,0in`
-o file.ps file.dvi
“-t a4 -O 0in,0in” option might be omitted. Then, convert a ps file to pdf file by using Acrobat Distiller.
Otherwise, you may convert a dvi file to a pdf file by using `dvipdfmx`.
`dvipdfmx -p a4 -x 1in -y 1in`
-o file.pdf file.dvi
“-p a4 -x 1in -y 1in” option might be omitted.

2. Omitted Commands

Some commands which is not required by `ieej-e.cls` are omitted. These commands are `\tableofcontents`, `\titlepage`, `\part`, `\theindex`, `headings`, `myheadings` and the related commands.

References

- (1) D.E. Knuth, *The T_EXbook*, Addison-Wesley (1994)
- (2) R. Seroul & S. Levy: *A Beginner's Book of T_EX*, Springer-Verlag (1989)
- (3) D. Salomon: *The Advanced T_EXbook*, Springer-Verlag (1995)
- (4) V. Eijkhout: *T_EX by Topic*, Addison-Wesley (1991)
- (5) P.W. Abrahams: *T_EX for the Impatient*, Addison-Wesley (1992)