

## 1. Introduction

elsarticle.cls is a thoroughly re-written document class for formatting L<sup>A</sup>T<sub>E</sub>X submissions to Elsevier journals. The class uses the environments and commands defined in L<sup>A</sup>T<sub>E</sub>X kernel without any change in the signature so that clashes with other contributed L<sup>A</sup>T<sub>E</sub>X packages such as hyperref.sty, preview-latex.sty, etc., will be minimal. elsarticle.cls is primarily built upon the default article.cls. This class depends on the following packages for its proper functioning:

1. natbib.sty for citation processing;
2. geometry.sty for margin settings;
3. fleqn.clo for left aligned equations;
4. graphicx.sty for graphics inclusion;
5. txfonts.sty optional font package, if the document is to be formatted with Times and compatible math fonts;
6. hyperref.sty optional packages if hyperlinking is required in the document;
7. endfloat.sty optional packages if floats to be placed at end of the PDF.

All the above packages (except some optional packages) are part of any standard L<sup>A</sup>T<sub>E</sub>X installation. Therefore, the users need not be bothered about downloading any extra packages. Furthermore, users are free to make use of ams math packages such as amsmath.sty, amsthm.sty, amssymb.sty, amsfonts.sty, etc., if they want to. All these packages work in tandem with elsarticle.cls without any problems.

## 2. Major Differences

Following are the major differences between elsarticle.cls and its predecessor package, elsart.cls:

- elsarticle.cls is built upon article.cls while elsart.cls is not. elsart.cls redefines many of the commands in the L<sup>A</sup>T<sub>E</sub>X classes/kernel, which can possibly cause surprising clashes with other contributed L<sup>A</sup>T<sub>E</sub>X packages;
- provides preprint document formatting by default, and optionally formats the document as per the final style of models 1+, 3+ and 5+ of Elsevier journals;

- some easier ways for formatting `list` and `theorem` environments are provided while people can still use `amsthm.sty` package;
- `natbib.sty` is the main citation processing package which can comprehensively handle all kinds of citations and works perfectly with `hyperref.sty` in combination with `hypernat.sty`;
- long title pages are processed correctly in preprint and final formats.

### 3. Installation

The package is available at author resources page at Elsevier (<http://www.elsevier.com/locate/latex>). It can also be found in Comprehensive T<sub>E</sub>X Archive Network (ctan), <https://ctan.org/pkg/elsarticle>.

Please download the `elsarticle.dtx` which is a composite class with documentation and `elsarticle.ins` which is the L<sup>A</sup>T<sub>E</sub>X installer file. When we compile the `elsarticle.ins` with L<sup>A</sup>T<sub>E</sub>X it provides the class file, `elsarticle.cls` by stripping off all the documentation from the `*.dtx` file. The class may be moved or copied to a place, usually, `$TEXMF/tex/latex/elsevier/`, or a folder which will be read by L<sup>A</sup>T<sub>E</sub>X during document compilation. The T<sub>E</sub>X file database needs updation after moving/copying class file. Usually, we use commands like `mktextlsr` or `texhash` depending upon the distribution and operating system.

### 4. Usage

The class should be loaded with the command:

```
\documentclass[<options>]{elsarticle}
```

where the `options` can be the following:

`preprint` default option which format the document for submission to Elsevier journals.

`review` similar to the `preprint` option, but increases the baselineskip to facilitate easier review process.

`1p` formats the article to the look and feel of the final format of model 1+ journals. This is always single column style.

`3p` formats the article to the look and feel of the final format of model 3+ journals. If the journal is a two column model, use `twocolumn` option in combination.

**5p** formats for model 5+ journals. This is always of two column style.

**authoryear** author-year citation style of natbib.sty. If you want to add extra options of natbib.sty, you may use the options as comma delimited strings as arguments to **\biboptions** command. An example would be:

```
\biboptions{longnamesfirst,angle,semicolon}
```

**number** numbered citation style. Extra options can be loaded with **\biboptions** command.

**sort&compress** sorts and compresses the numbered citations. For example, citation [1,2,3] will become [1–3].

**longtitle** if front matter is unusually long, use this option to split the title page across pages with the correct placement of title and author footnotes in the first page.

**times** loads txfonts.sty, if available in the system to use Times and compatible math fonts.

**reversenotenum** Use alphabets as author–affiliation linking labels and use numbers for author footnotes. By default, numbers will be used as author–affiliation linking labels and alphabets for author footnotes.

**lefttitle** To move title and author/affiliation block to flushleft. **centertitle** is the default option which produces center alignment.

**endfloat** To place all floats at the end of the document.

**nonatbib** To unload natbib.sty.

**doubleblind** To hide author name, affiliation, email address etc. for double blind refereeing purpose.

All options of article.cls can be used with this document class.

The default options loaded are **a4paper**, **10pt**, **oneside**, **onecolumn** and **preprint**.

## 5. Frontmatter

There are two types of frontmatter coding:

- (1) each author is connected to an affiliation with a footnote marker; hence all authors are grouped together and affiliations follow;
- (2) authors of same affiliations are grouped together and the relevant affiliation follows this group.

An example of coding the first type is provided below.

```
\title{This is a specimen title\tnoteref{t1,t2}}
\tnotetext[t1]{This document is the results of the research
  project funded by the National Science Foundation.}
\tnotetext[t2]{The second title footnote which is a longer
  text matter to fill through the whole text width and
  overflow into another line in the footnotes area of the
  first page.}
```

```
\author[1]{J.K. Krishnan\corref{cor1}}%
  \fnref{fn1}}
\ead{jkkr@example.in}

\author[1,2]{Han Thane\fnref{fn2}}
\ead{han@different.edu}

\author[3]{T. Rafeeq\fnref{fn1,fn3}}
\ead[url]{www.nowhere.com}

\cortext[cor1]{Corresponding author}
\fnintext[fn1]{This is the first author footnote.}
\fnintext[fn2]{Another author footnote, this is a very long footnote and
  it should be a really long footnote. But this footnote is not yet
  sufficiently long enough to make two lines of footnote text.}
\fnintext[fn3]{Yet another author footnote.}
```

```
\affiliation[1]{organization={Department of Physics,  
                        J.K. Institute of Science},  
              addressline={Jawahar Nagar},  
              city={Trivandrum},  
%              citysep={}, % Uncomment if no comma needed  
%              % between city and postcode  
              postcode={695013},  
              state={Kerala},  
              country={India}}  
  
\affiliation[2]{organization={World Scientific University},  
              addressline={Street 29},  
              postcode={1011 NX},  
              postcodesep={},  
              city={Amsterdam},  
              country={The Netherlands}}  
  
\affiliation[3]{organization={University of Intelligent Studies},  
              addressline={Street 15},  
              city={Jabaladesh},  
              postcode={825001},  
              state={Orissa},  
              country={India}}
```

The output of the above TeX source is given in Clips ?? and ??. The header portion or title area is given in Clip ?? and the footer area is given in Clip ??.

Clip 1: Header of the title page..

Clip 2: Footer of the title page..

Most of the commands such as `\title`, `\author`, `\affiliation` are self explanatory. Various components are linked to each other by a label–reference mechanism; for instance, title footnote is linked to the title with a footnote mark generated by referring to the `\label` string of the `\tnotetext`. We have used similar commands such as `\tnoteref` (to link title note to title); `\corref` (to link corresponding author text to corresponding author); `\fnref` (to link footnote text to the relevant author names).  $\text{\TeX}$  needs two compilations to resolve the footnote marks in the preamble part. Given below are the syntax of various note marks and note texts.

```
\tnoteref{<label(s)>}
\corref{<label(s)>}
\fnref{<label(s)>}
\tnotetext[<label>]{<title note text>}
\cortext[<label>]{<corresponding author note text>}
\fntext[<label>]{<author footnote text>}
```

where `<label(s)>` can be either one or more comma delimited label strings. The optional arguments to the `\author` command holds the ref label(s) of the address(es) to which the author is affiliated while each `\affiliation` command can have an optional argument of a label. In the same manner, `\tnotetext`, `\fntext`, `\cortext` will have optional arguments as their respective labels and note text as their mandatory argument.

The following example code provides the markup of the second type of author-affiliation.

```
\author{J.K. Krishnan\corref{cor1}%  
  \fnref{fn1}}  
\ead{jkk@example.in}  
\affiliation{organization={Department of Physics,  
  J.K. Institute of Science},  
  addressline={Jawahar Nagar},  
  city={Trivandrum},  
  %      citysep={}, % Uncomment if no comma needed  
  %      % between city and postcode  
  postcode={695013},  
  state={Kerala},  
  country={India}}  
  
\author{Han Thane\fnref{fn2}}  
\ead{han@different.edu}  
\affiliation{organization={World Scientific University},  
  addressline={Street 29},  
  postcode={1011 NX},  
  postcodesep={},  
  city={Amsterdam},  
  country={The Netherlands}}  
  
\author{T. Rafeeq\fnref{fn1,fn3}}  
\ead[url]{www.nowhere.com}  
\affiliation{organization={University of Intelligent Studies},  
  addressline={Street 15},  
  city={Jabaldesh},  
  postcode={825001},  
  state={Orissa},  
  country={India}}
```

```
\cortext{cor1}{Corresponding author}  
\fntext{fn1}{This is the first author footnote.}  
\fntext{fn2}{Another author footnote, this is a very long  
  footnote and it should be a really long footnote. But this  
  footnote is not yet sufficiently long enough to make two lines  
  of footnote text.}
```

The output of the above T<sub>E</sub>X source is given in Clip ??.

Clip 3: Header of the title page...

Clip ?? shows the output after giving `doubleblind` class option.

Clip 4: Double blind article.

The frontmatter part has further environments such as abstracts and keywords. These can be marked up in the following manner:

```
\begin{abstract}
  In this work we demonstrate the formation of a new type of
  polariton on the interface between a ....
\end{abstract}
```

```
\begin{keyword}
  quadruple exciton \sep polariton \sep WGM
\end{keyword}
```

Each keyword shall be separated by a `\sep` command. msc classifications shall be provided in the keyword environment with the commands `\MSC`. `\MSC` accepts an optional argument to accommodate future revisions. eg., `\MSC[2008]`. The default is 2000.



### 5.1. New page

Sometimes you may need to give a page-break and start a new page after title, author or abstract. Following commands can be used for this purpose.

```
\newpageafter{title}  
\newpageafter{author}  
\newpageafter{abstract}
```

`\newpageafter{title}` typeset the title alone on one page.

`\newpageafter{author}` typeset the title and author details on one page.

`\newpageafter{abstract}` typeset the title, author details and abstract & keywords one one page.

## 6. Floats

Figures may be included using the command, `\includegraphics` in combination with or without its several options to further control graphic. `\includegraphics` is provided by `graphic[s,x].sty` which is part of any standard L<sup>A</sup>T<sub>E</sub>X distribution. `graphicx.sty` is loaded by default. L<sup>A</sup>T<sub>E</sub>X accepts figures in the postscript format while pdfL<sup>A</sup>T<sub>E</sub>X accepts \*.pdf, \*.mps (meta-post), \*.jpg and \*.png formats. pdfL<sup>A</sup>T<sub>E</sub>X does not accept graphic files in the postscript format.

The `table` environment is handy for marking up tabular material. If users want to use `multirow.sty`, `array.sty`, etc., to fine control/enhance the tables, they are welcome to load any package of their choice and `elsarticle.cls` will work in combination with all loaded packages.

## 7. Theorem and theorem like environments

`elsarticle.cls` provides a few shortcuts to format theorems and theorem-like environments with ease. In all commands the options that are used with the `\newtheorem` command will work exactly in the same manner. `elsarticle.cls` provides three commands to format theorem or theorem-like environments:

```
\newtheorem{thm}{Theorem}  
\newtheorem{lem}[thm]{Lemma}  
\newdefinition{rmk}{Remark}  
\newproof{pf}{Proof}  
\newproof{pot}{Proof of Theorem \ref{thm2}}
```

The `\newtheorem` command formats a theorem in L<sup>A</sup>T<sub>E</sub>X's default style with italicized font, bold font for theorem heading and theorem number at the right hand side of the theorem heading. It also optionally accepts an argument which will be printed as an extra heading in parentheses.

```
\begin{thm}
  For system (8), consensus can be achieved with
  
$$\|T_{\omega z}\|
  \dots
  \begin{eqnarray}\label{10}
  \dots
  \end{eqnarray}
\end{thm}$$

```

Clip ?? will show you how some text enclosed between the above code looks like:

Clip 5: `\newtheorem`.

The `\newdefinition` command is the same in all respects as its `\newtheorem` counterpart except that the font shape is roman instead of italic. Both `\newdefinition` and `\newtheorem` commands automatically define counters for the environments defined.

Clip 6: `\newdefinition`.

The `\newproof` command defines proof environments with upright font shape. No counters are defined.

Clip 7: `\newproof.`

Users can also make use of `amsthm.sty` which will override all the default definitions described above.

## 8. Enumerated and Itemized Lists

elsarticle.cls provides an extended list processing macros which makes the usage a bit more user friendly than the default  $\text{\LaTeX}$  list macros. With an optional argument to the `\begin{enumerate}` command, you can change the list counter type and its attributes.

```
\begin{enumerate}[1.]
\item The enumerate environment starts with an optional
      argument '1.', so that the item counter will be suffixed
      by a period.
\item You can use 'a)' for alphabetical counter and '(i)' for
      roman counter.
\begin{enumerate}[a]
\item Another level of list with alphabetical counter.
\item One more item before we start another.
```

Clip 8: List – Enumerate.

Further, the enhanced list environment allows one to prefix a string like 'step' to all the item numbers.

```
\begin{enumerate}[Step 1.]
\item This is the first step of the example list.
\item Obviously this is the second step.
\item The final step to wind up this example.
\end{enumerate}
```

Clip 9: List – enhanced.

## 9. Cross-references

In electronic publications, articles may be internally hyperlinked. Hyperlinks are generated from proper cross-references in the article. For example, the words Fig. 1 will never be more than simple text, whereas the proper cross-reference `\ref{tiger}` may be turned into a hyperlink to the figure itself: [Fig. 1](#). In the same way, the words [Ref. \[1\]](#) will fail to turn into a hyperlink; the proper cross-reference is `\cite{Knuth96}`. Cross-referencing is possible in L<sup>A</sup>T<sub>E</sub>X for sections, subsections, formulae, figures, tables, and literature references.

## 10. Mathematical symbols and formulae

Many physical/mathematical sciences authors require more mathematical symbols than the few that are provided in standard L<sup>A</sup>T<sub>E</sub>X. A useful package for additional symbols is the `amssymb` package, developed by the American Mathematical Society. This package includes such oft-used symbols as  $\lesssim$  (`\lessssim`),  $\gtrsim$  (`\gtrsim`) or  $\hbar$  (`\hbar`). Note that your T<sub>E</sub>X system should have the `msam` and `msbm` fonts installed. If you need only a few symbols, such as  $\square$  (`\Box`), you might try the package `latexsym`.

Another point which would require authors' attention is the breaking up of long equations. When you use `elsarticle.cls` for formatting your submissions in the `preprint` mode, the document is formatted in single column style with a text width of 384pt or 5.3in. When this document is formatted for final print and if the journal happens to be a double column journal,

the text width will be reduced to 224pt at for 3+ double column and 5+ journals respectively. All the nifty fine-tuning in equation breaking done by the author goes to waste in such cases. Therefore, authors are requested to check this problem by typesetting their submissions in final format as well just to see if their equations are broken at appropriate places, by changing appropriate options in the document class loading command, which is explained in section ??, ??. This allows authors to fix any equation breaking problem before submission for publication. elsarticle.cls supports formatting the author submission in different types of final format. This is further discussed in section ??, ??.

### Displayed equations and double column journals

Many Elsevier journals print their text in two columns. Since the preprint layout uses a larger line width than such columns, the formulae are too wide for the line width in print. Here is an example of an equation (see equation 6) which is perfect in a single column preprint format:

In normal course, articles are prepared and submitted in single column format even if the final printed article will come in a double column format journal. Here the problem is that when the article is typeset by the typesetters for paginating and fit within the single column width, they have to break the lengthy equations and align them properly. Even if most of the tasks in preparing your proof is automated, the equation breaking and aligning requires manual judgement, hence this task is manual. When there comes a manual operation that area is error prone. Author needs to check that equation pretty well.

However if authors themselves break the equation to the single column width typesetters need not want to touch these area and the proof authors get will be without any errors.

Clip 10: See equation (6).

When this document is typeset for publication in a model 3+ journal with double columns, the equation will overlap the second column text matter if the equation is not broken at the appropriate location.

Clip 11: See equation (6) overprints into second column.

The typesetter will try to break the equation which need not necessarily be to the liking of the author or as it happens, typesetter's break point may be semantically incorrect. Therefore, authors may check their submissions for the incidence of such long equations and break the equations at the correct places so that the final typeset copy will be as they wish.

## 11. Bibliography

Three bibliographic style files (\*.bst) are provided — elsarticle-num.bst, elsarticle-num-names.bst and elsarticle-harv.bst — the first one can be used for the numbered scheme, second one for numbered with new options of natbib.sty. The third one is for the author year scheme.

In L<sup>A</sup>T<sub>E</sub>X literature, references are listed in the `thebibliography` environment. Each reference is a `\bibitem` and each `\bibitem` is identified by a label, by which it can be cited in the text:

`\bibitem[Elson et al.(1996)]{ESG96}` is cited as `\citet{ESG96}`.

In connection with cross-referencing and possible future hyperlinking it is not a good idea to collect more than one literature item in one `\bibitem`. The so-called Harvard or author-year style of referencing is enabled by the L<sup>A</sup>T<sub>E</sub>X package natbib. With this package the literature can be cited as follows:

- Parenthetical: `\citep{WB96}` produces (Wettig & Brown, 1996).

- Textual: `\citet{ESG96}` produces Elson et al. (1996).
- An affix and part of a reference: `\citep[e.g.][Ch. 2]{Gea97}` produces (e.g. Governato et al., 1997, Ch. 2).

In the numbered scheme of citation, `\cite{<label>}` is used, since `\citep` or `\citet` has no relevance in the numbered scheme. `natbib` package is loaded by `elsarticle` with `numbers` as default option. You can change this to author-year or harvard scheme by adding option `authoryear` in the class loading command. If you want to use more options of the `natbib` package, you can do so with the `\biboptions` command, which is described in the section ??, ??. For details of various options of the `natbib` package, please take a look at the `natbib` documentation, which is part of any standard L<sup>A</sup>T<sub>E</sub>X installation.

In addition to the above standard `.bst` files, there are 10 journal-specific `.bst` files also available. Instruction for using these `.bst` files can be found at <http://support.stmdocs.in>

## 12. Graphical abstract and highlights

A template for adding graphical abstract and highlights are available now. This will appear as the first two pages of the PDF before the article content begins.

Please refer below to see how to code them.

```
....  
....  
  
\end{abstract}  
  
%%Graphical abstract  
\begin{graphicalabstract}  
%\includegraphics{grabs}  
\end{graphicalabstract}  
  
%%Research highlights  
\begin{highlights}  
\item Research highlight 1  
\item Research highlight 2  
\end{highlights}  
  
\begin{keyword}  
%% keywords here, in the form: keyword \sep keyword  
....  
....
```

### 13. Final print

The authors can format their submission to the page size and margins of their preferred journal. elsarticle provides four class options for the same. But it does not mean that using these options you can emulate the exact page layout of the final print copy.

1p: 1+ journals with a text area of 384pt × 562pt or 13.5cm × 19.75cm or 5.3in × 7.78in, single column style only.

3p: 3+ journals with a text area of 468pt × 622pt or 16.45cm × 21.9cm or 6.5in × 8.6in, single column style.

twocolumn: should be used along with 3p option if the journal is 3+ with the same text area as above, but double column style.

5p: 5+ with text area of 522pt × 682pt or 18.35cm × 24cm or 7.22in × 9.45in, double column style only.

Following pages have the clippings of different parts of the title page of different journal models typeset in final format.



Model 1+ and 3+ will have the same look and feel in the typeset copy when presented in this document. That is also the case with the double column 3+ and 5+ journal article pages. The only difference will be wider text width of higher models. Here are the specimen single and double column journal pages.





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