Wits Electrical Engineering Exam Class

Alan Robert Clark/Previously: Dean Redelinghuys

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Abstract

This class provides a structure for preparing and setting examinations and class tests under LaTeX 2$_\varepsilon$. Multiple-choice questions as well as sub-questions are handled. The cover page doesn't need to be typed by anyone else either!

1 Quick Start - Using `exam.cls`

Please read this whole section at least!

1. Start a new document using the `exam` class (the `11pt` option is used by *default* for a better font size - change it with `10pt` or `12pt` if you like).

   If you want the cover page, use the option `cover`. Otherwise, a blank page is printed to hide your exam from prying eyes.

2. Add the following commands in the preamble to define some data needed for typesetting (some are only needed if you use `cover` as an option):

Command	Description	**Cover** only
\coursecode	Course code, like`ELEN101`.	-
\coursename	Course name, like "Engineering Design".	-
\exammonth	Month and year of exam, in words.	X
\studyyear	Year of study (e.g., "First").	X
\studydegs	Degrees begin awarded (e.g., ''BSc (Eng) (Elec)'', which is the default).	X
\faculties	Defaults to `Engineering`.	X
\internal	Internal examiners and extensions.	X
\external	External examiners.	X
\require	Special requirements block.	X
\duration	Duration of exam. If the course codes write for different amounts of time, separate the times on lines, like you did for the \coursecode.	X
\instruct	Instructions block. I almost always simply say "See page 1".	X

   Each of the items is placed into a `minipage` environment, so you can typeset stuff as you like. The only catch is the \coursecode and \coursename: Try to make those single lines. If you can't, redefine (especially) the \coursecode immediately after the \makeheads command.

3. Start your document and issue a \makeheads command to typeset either the cover page (option `cover`) or a covering sheet which hides the innards of the exam.

4. Start each question with a \question command. Finish it with the command \marks{nn} where ⟨*nn*⟩ is your total for the question. If you want to provide more structure, use \marks{nn} for a part of a question, and \totalmarks{nn} for the total marks for a question.

5. Itemised lists are now numbered (a) etc. for the first level, and ii etc. for the second level.

6. For squeezed lists, use the `squashenum` environment, which is an `enumerate` with no lines between items.

7. You can have multiple choice questions with `\mcq` and the Alan Clark Gems `\Banum` and `\Eanum`. Special mcq items are defined with the command `\mcqi`, with an optional mark as the argument. See options (Sec. 3.1) for more info.

8. You can place optional printed material in a `\comment` command. This is only printed if `comments` is passed as an option. Most people (Alan and I) use it for two things: discussion of what we are aiming at in the question, and/or complete solutions to each question! Makes marking really easy, and those examiners meetings may never be the same.

9. If you have the `draftcopy` package and you ordinarily print via a `dvips` postscript step, a very useful toy is to place the following at the top of your document:

```
%\documentclass[cover]{exam}
\documentclass[cover,comments]{exam}\usepackage{draftcopy}\draftcopyName{ANSWER}{160}
```

(All as one line etc. You then simply comment out the one you dont need!) A greyed out, massive ANSWER appears diagonally across each page. No matter how Dof the exams office is, its unlikely to be printed :-)

2   The Documentation Driver

The following code will generate the documentation for this file. Since it is the first piece of code, and it is separated by a special option, this file can be used to produce the documentation but this code will *not* appear in the class.

```
⟨∗driver⟩
\documentclass[a4paper]{article}
\usepackage{A4ee,tabularx}
\usepackage{doc}
\begin{document} \DocInput{exam.dtx} \end{document}
⟨/driver⟩
```

3   The Code

We begin by announcing which class this is and what it requires.

```
\NeedsTeXFormat{LaTeX2e}
\ProvidesClass{exam}[1998/10/05 v1.6 Wits Elec. Eng. Exam Class]
```

This class is based heavily on the article option, so we need to load and send standard options to the `article` class, except our own definitions, which are covered in the next section.

3.1   Class Options

This class provides two options to the user: `comments`, which typesets the `\comment`s, and `showsol` which shows the solutions for multiple-choice questions. We must also strictly disallow double-sided layout:

```
\DeclareOption{showsol}
  {\AtBeginDocument{%
```

```
      \renewcommand{\mcqsol}[1]{\marginpar{\footnotesize\scshape%
      {}\ensuremath{[[#1]]}}}%
      }}
   \DeclareOption{comments}
      {\AtBeginDocument{%
      \renewcommand{\comment}[1]{{\footnotesize\scshape #1\vspace*{0.5em}\\}}%
      \renewcommand{\commenthead}{\textsc{Do Not Send for Printing!}}%
      }}
```

A final option, `cover`, redefines the `\makeheads` command (at the `\begin{document}`) to print the official looking cover page instead of the blank page. We need some boxes for that: `\internal`, `\external`, `\duration`, `\require`, `\instruct`, `\exammonth`, `\studyyear`, `\faculties`, `\studydegs`, `\coursecode`, `\coursename`.

```
\newcommand{\eeInternal}{None}
\newcommand{\internal}[1]{\renewcommand{\eeInternal}{#1}}
\newcommand{\eeExternal}{None}
\newcommand{\external}[1]{\renewcommand{\eeExternal}{#1}}
\newcommand{\eeDuration}{Three (3)}
\newcommand{\duration}[1]{\renewcommand{\eeDuration}{#1}}
\newcommand{\eeRequires}{None}
\newcommand{\require}[1]{\renewcommand{\eeRequires}{#1}}
\newcommand{\eeInstruct}{None}
\newcommand{\instruct}[1]{\renewcommand{\eeInstruct}{#1}}
\newcommand{\eeMonth}{TBA}
\newcommand{\exammonth}[1]{\renewcommand{\eeMonth}{#1}}
\newcommand{\eeYoS}{TBA}
\newcommand{\studyyear}[1]{\renewcommand{\eeYoS}{#1}}
\newcommand{\eeFacs}{Engineering}
\newcommand{\faculties}[1]{\renewcommand{\eeFacs}{#1}}
\newcommand{\eeDegs}{BSc (Eng) Elec}
\newcommand{\studydegs}[1]{\renewcommand{\eeDegs}{#1}}
\newcommand{\eeCCode}{ELEN???}
\newcommand{\coursecode}[1]{\renewcommand{\eeCCode}{#1}%
   \markright{\eeCCode -- \eeCName}}
\newcommand{\eeCName}{??}
\newcommand{\coursename}[1]{\renewcommand{\eeCName}{#1}%
   \markright{\eeCCode -- \eeCName}}
```

And now we can define `cover` (I use a picture environment; if anyone can tell me an easier way to do this let me know!)

```
\DeclareOption{cover}
  {\AtBeginDocument{%
    \renewcommand{\makeheads}{
    \addtolength{\evensidemargin}{-15mm}
    \addtolength{\oddsidemargin}{-15mm}
    \addtolength{\textwidth}{30mm}
    \begin{titlepage}%
    \thispagestyle{empty}
    \vspace*{-35mm}

    % temporarily shift the margins
    \fbox{\parbox[c]{25mm}{\raggedleft hrs}}\hspace*{10mm}
    \fbox{\parbox[c]{25mm}{\centering ~~/~~/20~~}}\hspace*{10mm}
    \fbox{\parbox[c]{50mm}{\strut}}\hspace*{13mm}\begin{tabular}{c}
    Exams Office\\Use Only\end{tabular}\medskip

    ~\rule{180mm}{0.4pt}~\\
    \begin{samepage}
    \begin{textsf}
    {\large University of the Witwatersrand, Johannesburg}\bigskip
```

```latex
\unitlength 1.00mm
\linethickness{0.4pt}
\begin{picture}(190.00,205.00)(5,5)
\put(5.00,19.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Instructions to candidates\\
  (Examiners may wish to use\\
  this space to indicate, inter alia,\\
  the contribution made by this\\
  examination or test towards\\
  the year mark, if appropriate)\end{tabular}}}
\put(5.00,50.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Time allowance\end{tabular}}}
\put(5.00,70.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Special materials required\\
  (graph/music/drawing paper)\\
  maps, diagrams, tables,\\
  computer cards, etc)\end{tabular}}}
\put(5.00,90.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  External examiner(s)\end{tabular}}}
\put(5.00,110.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Internal examiners\\and telephone\\number(s)\end{tabular}}}
\put(5.00,125.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Faculty/ies presenting\\candidates\end{tabular}}}
\put(5.00,160.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Year of Study\\(Art \& Sciences leave blank)\end{tabular}}}
\put(5.00,145.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Degrees/Diplomas for which\\this course is prescribed\\
  (BSc (Eng) should indicate which branch)\end{tabular}}}
\put(5.00,175.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Examination/Test$^*$ to be\\held during month(s) of\\
  \footnotesize($^*$delete as applicable)\end{tabular}}}
\put(5.00,190.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Course or topic name(s)\\Paper Number \& title\end{tabular}}}
\put(5.00,205.00){\makebox(0,0)[lc]{\small\begin{tabular}{l}
  Course or topic No(s)\end{tabular}}}
\put(90.00,5.00){\framebox(100.00,28.00)[cc]{\begin{minipage}{95mm}
  \centering\small\texttt{\eeInstruct}\end{minipage}}}
\put(90.00,40.00){\framebox(20.00,15.00)[cc]{\small
  \shortstack{Course\\Nos}}}
\put(110.00,40.00){\framebox(40.00,15.00)[cc]{\small
  \begin{minipage}{14mm}\centering\texttt{\eeCCode}\end{minipage}}}
\put(150.00,40.00){\framebox(18.00,15.00)[cc]{\small Hours}}
\put(168.00,40.00){\framebox(22.00,15.00)[cc]{\small
  \begin{minipage}{22mm}\centering\texttt{\eeDuration}\end{minipage}}}
\put(90.00,63.00){\framebox(100.00,13.00)[cc]{\small
  \begin{minipage}{95mm}\centering\ttfamily\eeRequires\end{minipage}}}
\put(90.00,83.00){\framebox(100.00,13.00)[cc]{\small
  \begin{minipage}{95mm}\centering\ttfamily\eeExternal\end{minipage}}}
\put(90.00,100.00){\framebox(100.00,13.00)[cc]{\small
  \begin{minipage}{95mm}\centering\ttfamily\eeInternal\end{minipage}}}
\put(110.00,122.00){\framebox(80.00,8.00)[cc]{\small
  \begin{minipage}{75mm}\centering\ttfamily\eeFacs\end{minipage}}}
\put(110.00,136.00){\framebox(80.00,13.00)[cc]{\small
  \begin{minipage}{75mm}\centering\ttfamily\eeDegs\end{minipage}}}
\put(110.00,157.00){\framebox(80.00,8.00)[cc]{\small
  \begin{minipage}{75mm}\centering\ttfamily\eeYoS\end{minipage}}}
\put(110.00,172.00){\framebox(80.00,8.00)[cc]{\small
  \begin{minipage}{75mm}\centering\ttfamily\eeMonth\end{minipage}}}
\put(90.00,187.00){\framebox(100.00,10.00)[cc]{\small
  \begin{minipage}{95mm}\centering\ttfamily\eeCName\end{minipage}}}
\put(110.00,202.00){\framebox(80.00,8.00)[cc]{\small
  \begin{minipage}{75mm}\centering\ttfamily\eeCCode\end{minipage}}}
```

```
\end{picture}
\bigskip

    {\Large Internal Examiners or Heads of Department are requested to sign
    the declaration overleaf}
    \end{textsf}
    \end{samepage}
    \newpage\vspace{40mm}
    1. As the Internal Examiner/Head of Department, I certify that this
    question paper is in final form, as approved by the External Examiner,
    and is ready for reproduction.\\[10mm]
    2. As the Internal Examiner/Head of Department, I certify that this
    question paper is in final form and is ready for reproduction.\\[10mm]
    (1. is applicable to formal examinations as approved by an external
    examiner, while 2. is applicable to formal tests not requiring approval
    by an external examiner---Delete whichever is not applicable)\\[20mm]
    Name:\hrulefill\ \  Signature:\hrulefill\\[20mm](THIS PAGE NOT FOR
    REPRODUCTION)
    \end{titlepage}
    \addtolength{\evensidemargin}{15mm}
    \addtolength{\oddsidemargin}{15mm}
    \addtolength{\textwidth}{-30mm}}
    }%
  }
```

The rest of the options need to be passed on to the `article` class.

```
\DeclareOption*{\PassOptionsToClass{\CurrentOption}{article}}
\PassOptionsToClass{a4paper,11pt}{article}
\ProcessOptions
\LoadClass{article}
```

3.2 Margins and Page Style

Somehow we always manage to redefine these, although they should have been set up by the **a4paper** option passed to article above, so:

```
\setlength{\topmargin}{-3mm}
\setlength{\headheight}{5mm}
\setlength{\headsep}{15mm}
\setlength{\textheight}{240mm}
\setlength{\footskip}{0mm}
\setlength{\oddsidemargin}{0mm}
\setlength{\textwidth}{150mm}
\setlength{\evensidemargin}{10mm}
\setlength{\parskip}{\medskipamount}
\setlength{\parindent}{0em}
\setlength{\unitlength}{1mm}
\setlength{\marginparwidth}{40pt}
\setlength{\marginparsep}{10pt}
\brokenpenalty=10000
```

3.2.1 Special Holders

We define `\eeCourse` to hold the course code and `\eelastpg` to hold the last page of the report (may be auto-generated). We also need our own counter to add up the questions.

The user can change these by specifying the commands `\course` (sensible) and `\lastpg` (to override the auto-generation).

```
\newcounter{qno}
```

```
\newcommand{\eelastpg}{\pageref{@last-page}}
\newcommand{\lastpg}[1]{\renewcommand{\eelastpg}{#1}}
```

3.2.2 How to flag the last page of a document

Under LaTeX 2_ε, this is so simple it's scary!!!

```
\AtEndDocument{\label{@last-page}}
```

3.3 The Cover Page

To hide this from prying eyes, and to let other people know about what's happening, we define a "dummy" `\makeheads` command.

```
\newcommand{\makeheads}{\begin{titlepage}\vspace{80mm}\thispagestyle{empty}
  Examination question paper for:
  \begin{center}\Large \eeCCode -- \eeCName \end{center}
  Printed on:\quad \today.\par This covering page \emph{must not} be sent
  for printing as part of the question paper.
  \end{titlepage}}
```

3.4 Page Headers

This prints the exam title, the page (and last page) info, and turns off page numbering at the base of the page.

```
\AtBeginDocument{\pagestyle{empty}
\markright{\eeCCode -- \eeCName \commenthead}
\renewcommand{\@oddhead}{\hbox{}\sl\rightmark \hfil
\rm (\eelastpg\ pages---page \thepage)}}
```

3.5 Questions

Two types, either a `Question` which is a biggy, or a `Q`, which is smaller but still a whole question.

```
\newcommand{\question}{\addtocounter{qno}{1}\subsection*{Question \theqno}}
\newcommand{\quest}{\addtocounter{qno}{1}\par{\bf Q\theqno :\quad}}
```

3.6 Multiple-Choice Support

Because multiple-choice is used so often, we support the use of the environment `mcq` to define a multiple-choice question, which is automatically numbered as a sub-number of the current question. The advantage of this is that the multiple choice question is *never* broken across a page (this may become a problem is your questions are too long, but then ask yourself why that is so!

```
\newcounter{mcqno}[qno]
\newenvironment{mcq}%
{\addtocounter{mcqno}{1}\par\relax\begin{samepage}\theqno.\themcqno \quad}%
{\end{samepage}\medskip\par\pagebreak[1]}
```

Lists seem an integral component of an exam. However, we usually denote the second part of question 1 as (b), and the third portion of that iii. so we redefine a few commands. We would like to refer to this as 1(a)-iii and we make this so.

Note that this does not preclude the possiblity of using other lists yourself, it just changes the default behaviour.

```
\makeatletter
\renewcommand{\theenumi}{(\alph{enumi})}
\renewcommand{\theenumii}{\roman{enumii}}
\renewcommand{\labelenumi}{\theenumi}
\renewcommand{\labelenumii}{\theenumii.}
\renewcommand{\p@enumi}{\theqno}
\renewcommand{\p@enumii}{\theqno\theenumi--}
```

Now you may like to squash up your questions, so either use the `\Banum` and `\Eanum` stuff from Alan Clark (included here) or use the more general (and hopefully more robust) `squashenum` environment.

```
\newenvironment{squashenum}{\begin{enumerate}\setlength{\parsep}{0pt}}%
  {\end{enumerate}}
```

To add the options, we provide Alan Clark's `\Banum` and `\Eanum` commands, which produce alpha enumerated scrunched lists (which works exactly right):

```
\providecommand{\Banum}{\begin{list}%
    {(\alph{enumi})}{\usecounter{enumi}}\parskip=0pt}
\providecommand{\Eanum}{\end{list}}
```

We defined the class option `showsol` which shows solutions where necessary. Well, multiple-choice is where they are really useful; we can define an optional argument for the `\mcqi` (kind of like an `\item`), denoting the marks for the particular multiple-choice question. This is printed *only when showsol is used*. In this way, we can embed our solutions, and hide them from printing by omitting the `showsol` option in the declaration.

For long questions, and discussion-type musings, we provide the command `\comment`, which is ignored if the option `comments` is not used, but printed in a special way if it is (see Options above).

```
\newcommand{\mcqi}[1][??]{\item \mbox{}\mcqsol{#1}}
\newcommand{\mcqsol}[1]{\relax}
\newcommand{\comment}[1]{\relax}
\newcommand{\commenthead}{\relax}
```

`\mcqsol` is redefined (if necessary) in the options-passing section, but deferred until all of the preamble is done. Likewise for `\comment`.

3.7 Marks

Each question should denote the total marks, so we use a special command `\rhfit` internally to make sure the marks are on the right hand side of the page. Then we define `\marks` and `\totalmarks` for consistent typesetting of these objects.

```
\newcommand{\rhfit}[1]{
{\unskip\nobreak\hfil\penalty50\hskip2em\vadjust{}\nobreak\hfil
{#1}\parfillskip=0pt \finalhyphendemerits=0 \par}}
\providecommand{\marks}[1]{\rhfit{\textsf{(#1~marks)}}}
\providecommand{\totalmarks}[1]{\rhfit{\textsf{[Total Marks #1]}}}
```

3.8 Figures

Somehow exams need special treatment of figures, so:

```
\newcommand{\fig}[1]{\addtocounter{figure}{1}
```

```
\begin{center}\vspace*{#1}Figure \thefigure\end{center}}
\newcommand{\figc}[2]{\addtocounter{figure}{1}
\begin{center}\vspace*{#1}Figure \thefigure : {#2}\end{center}}
\newcommand{\figf}[1]{\addtocounter{figure}{1}\begin{figure}[htb]
\vspace{#1}\begin{center}Figure \thefigure\end{center} \end{figure}}
\newcommand{\figcf}[2]{\addtocounter{figure}{1}\begin{figure}[htb]
\vspace{#1}\begin{center}Figure \thefigure : {#2}\end{center} \end{figure}}
```

Revision History

This is surrounded by documentation tags, so it should not be inserted into the style file.

⟨∗driver⟩

```
$Log: exam.dtx,v $
Revision 1.7  1998-11-30 08:02:49+02  redel
Added comment warning on each page. Not sure if it works!

Revision 1.6  1998/10/04 18:36:36  redel
Changed ver. number.

Revision 1.6  1997/10/22 06:21:01  redel
Re-introduced to RCS

Revision 1.4  1997/10/21 05:19:43  redel
Fixed multiple page number bug (thanks George)

Revision 1.3  1997/10/10 05:54:55  redel
Added squashenum, default behaviour of lists. Fixed some bugs.

Revision 1.2  1997/10/09 03:05:52  redel
Finished cover page, documentation

Revision 1.1  1997/10/08 02:52:16  redel
Added cover option. Not yet finished!
```

⟨/driver⟩