Package ethuebung for ETH Exercise Sheets

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This package provides a unified way of typing exercises for ETH Zurich. While you type in logically all aspects of your exercise using provided LaTeX macros (title, text, hints, solution, etc.), it is rendered according to some standard style (yet remaining highly customizable), and provides different versions of the sheet for distributing to students (without the solutions), or for TA's (with solutions).

Contents

1 Quick Start Guide and Simple Usage.

Copy the style file `ethuebung.sty` into the same directory as your exercise sheet LaTeX file. No other files are needed (no logo images etc. are needed as they are packaged with the style file). Start off with the following minimal template.

```
\documentclass[11pt,a4paper]{article}

\usepackage{ethuebung} % comment this and uncomment next line for solutions
%\usepackage[sol]{ethuebung} % uncomment for solutions

\UebungLecture{Microstructures of molten cheese.}
\UebungProf{Prof. Zebigboss}
\UebungSemester{HS 2999}

\UebungsblattNumber{1}

\begin{document}
\MakeUebungHeader

\exercise{Title of the exercise.}

In this exercise, you will be asked to do some work.

\begin{exenumerate}
\item Solve the following equation.
    \begin{align}
        x^2 = 1\ .
    \end{align}
    \hint{There might be more than one solution.}

    \begin{solution}
        Write here the solution to this exercise.
    \end{solution}
\end{exenumerate}

\end{document}
```

If you want the **German** version of the template, simply pass the `[german]` option to the `\usepackage` directive (see also Sec. 3.3),

```
  \usepackage[deutsch]{ethuebung} % German version, "Uebungsblatt"
  %\usepackage[deutsch,sol]{ethuebung} % German verion, "Musterloesung"
```

Obviously you'll have to fill in the title of your lecture, the lecturer and the semester accordingly using the `\UebungLecture`(page 4), `\UebungProf`(page 4) or `\UebungLecturer`(page 4), and `\UebungSemester`(page 4) commands. Use the `\UebungsblattNumber`(page 4) command to specify the number of the exercise sheet (usually increases by one every week). Don't forget the `\MakeUebungHeader`(page 5) command at the beginning of the document to actually draw the header.

Write the solutions to each exercise inline, using a `\begin{loesung}...\end{loesung}`(page 9) or `\begin{solution}...\end{solution}`(page 9) environment. When you compile the code above, then the solutions will not appear.

If you want to generate a solutions sheet with the solutions displayed (eg. for the TA's or for the students after they handed in), then simply change the two lines:

```
\usepackage{ethuebung} % comment this and uncomment next line for solutions
%\usepackage[sol]{ethuebung} % uncomment for solutions
```

to:

```
%\usepackage{ethuebung} % comment this and uncomment next line for solutions
\usepackage[sol]{ethuebung} % uncomment for solutions
```

Recompile the sheet, and the solutions will be displayed.

2 What This Package Does

This package provides a unified way of typing exercises for ETH Zurich. While you type in logically all aspects of your exercise using provided LaTeX macros (title, text, hints, solution, etc.), it is rendered according to some standard style (yet remaining highly customizable), and provides different versions of the sheet for distributing to students (without the solutions), or for TA's (with solutions).

ex numbering

both ex sheet/solution sheet

- eqns in solution numbered by themselves - can attach pdfs for solution

3 Setting Up The Exercise Sheet

3.1 Lecture, Lecturer, Semester

Setting up the exercise sheet is just a matter of calling a small number of commands before the beginning of your document, in the preamble. See the template given in Sec. 1. These lines could be for example:

```
\UebungLecture{Microstructures of molten cheese.}
\UebungProf{Prof. Zebigboss}
\UebungSemester{HS 2999}

\UebungsblattNumber{1}
```

`\UebungLecture{...}` This command sets the title of your lecture to the given argument. The lecture title is displayed in the main exercise header.

`\UebungProf{...}` Use this command to set the professor or lecturer of the course to the given argument.

`\UebungLecturer{...}` This command is an exact alias of `\UebungProf`.

`\UebungSemester{...}` This command sets the semester that will be displayed in the header.

`\UebungsblattNumber{...}` This sets the exercise sheet number to the given argument. The exercise sheet number usually starts at 1, and increases every week as more exercise sheets are distributed.

TIP These commands should be called in the preamble, but they just internally expand to an internal macro definition. So technically they can be called whenever you want. Just call them before calling any other macro that actually uses those values, e.g. `\MakeUebungHeader`(page 5). Calling such a macro a second time with a different value overrides the previous value.

3.2 Exercise Sheet Header

The page header is generated automatically by the package, however you should call the command `\MakeUebungHeader` explicitely at the beginning of the document.

`\MakeUebungHeader`	Draws the main header of the exercise sheet, in three parts, with ETH logo, centered title, and professor/semester displayed on the right. And a horizontal line under those.

The header automatically displays the right title, according to whether the exercise sheet without the solutions or with the solutions is displayed, respectively printing "Series" or "Solutions". The appropriate titles are also automatically displayed in German when the `german` package option is provided.

TIP If you want to display some other string, like "Exercise Sheet", this title can be customized using commands `\UebungsblattTitleSeries`(page ??) and `\UebungsblattTitleSolutions`(page ??). The font can also be changed, use `\UebungsblattTitleFont`(page ??).
The header itself is highly customizable, see Sec. 6.1.

3.3 Exercise Sheet Language: German or English

```
\usepackage[deutsch]{ethuebung} % German version, "Uebungsblatt"
```

will provide you the German version of the exercise sheet. Simply adding the `sol` package option will provide you the "Musterlösung":

```
\usepackage[deutsch,sol]{ethuebung} % German verion, "Musterloesung"
```

TIP This package option does nothing else than redefining (re-customizing) the sheet title for exercises and for solutions, the exercise label using the commands `\UebungsblattTitleSeries`(page ??) etc. documented in section 6. It also automatically includes the LaTeX `babel` package with the `[german]` option.

4 Exercises

4.1 `\begin{exenumerate}...\end{exenumerate}` environment

`\begin{exenumerate} ... \end{exenumerate}`
This environment provides a `enumerate`-like environment, with labels (a), (b), ... by default, with which you can split an exercise into several parts. Use `\item` for each part, as for `itemize` and `enumerate`.

Such `\begin{exenumerate}...\end{exenumerate}` environments can be nested up to two levels (by default), and the second level will be numbered (by default) (i), (ii), ...

These environments may be broken and resumed, and their numbering will be automatically resumed correctly and reset for each exercise. This is useful to add comments or to introduce new concepts between different parts of an exercise.

For example:

```
Consider the setting in which one applies a positive voltage between
the source and the gate leeds. Answer the following questions.
\begin{exenumerate}
\item % This is (a)
    Calculate quantity blah blah for this setting.

\item % This is (b)
    What happens at the edge of the sample with this setting?

\end{exenumerate}

Now, consider setting a {\em negative} voltage instead.
\begin{exenumerate}
\item % This item will automatically be labelled (c).
    Recalculate the quantity blah blah for this setting.

\end{exenumerate}
```

Last but not least, you can refer to different parts of the exercise with LaTeX's usual `\label{...}` and `\ref{...}` commands, as for example:

```
\begin{exenumerate}
\item % This is item (a)
    \label{expart:FirstQuestion}
    Prove Fermat's big theorem.

\item % This is item (b)
```

```
    Convince yourself that question~\ref{expart:FirstQuestion} is
    quite difficult.
    % this will display "Convince yourself that question (a) ..."

\end{exenumerate}
```

TIP See section 6.2 for commands available to customize the `\begin{exenumerate}...\end{exenumerate}` environment, in particular `\UebungLabelEnum`.

4.2 Hints

Hints can be introduced with the `\hint` and `\hints` commands.

`\hint{...}` Displays some text meant as a hint to the student with a label "Hint". A special font is used (e.g. small and italic)

`\hints{...}` Same as `\hint`, except uses the label "Hints". Use this when several hints are given at once.

For example:

```
\hint{Remember that a unitary $U$ satisfies
    $UU^\dagger=U^\dagger U=\mathbb{I}$.}
```

or, if there are several hints,

```
\hints{Remember that a unitary $U$ satisfies
    $UU^\dagger=U^\dagger U=\mathbb{I}$.

    Also, a rotation $R$ satisfies $RR^T=R^T R=\mathbb{I}$.
}
```

TIP You can customize the appearance of the hint text, as well as the label used for hints with the `\UebungHinweisLabel`(page ??), `\UebungHinweiseLabel`(page ??), and the `\UebungHinweisFont`(page ??) commands.

4.3 Splitting exercises into 'Sub-Exercises'

You can split exercises into sub-exercises, in the same spirit as when in a regular LaTeX article you split `\section`'s into `\subsection`'s.

`\subuebung{...}`	Define a sub-exercise, the title of which will be the argument given. This will number the sub-exercise automatically.

`\subexercise{...}`	Exactly the same as `\subuebung`

The following example:

```
\exercise{Quantization of the Electromagnetic Field.}
In this exercise, we will learn to quantize the electromagnetic field.

\subexercise{Classical Case.}
First, here are some questions about classical E-M fields...

...

\subexercise{Quantum Case.}
Now we will quantize the E-M field...

...
```

will appear as:

Exercise N. ***Quantization of the Electromagnetic Field.***
In this exercise ....
...
N.1 ***Classical Case.*** First, here are ...
...
N.2 ***Quantum Case.*** Now we ...
...

TIP Leaving an extra (blank) newline between `\subexercise` and the sub-exercise text will produce the sub-exercise text on a new line.

TIP Of course, `\subexercise` is customizable, too. See section 6.3.

4.4 Note About Figures

notes about figures?

5 Solutions

5.1 Solutions are hidden or shown for the proper sheet version.

You should write up the solutions for an exercise immedately after the exercise, or between exercise parts, using a `\begin{loesung}...\end{loesung}` environment. When the sheet is compiled in "exercise sheet" mode (the default), then the solutions are simply ignored and not displayed. However, when the package option `sol` is provided, or if the command `\UebungMakeSolutionsSheet`(page ??) is called, then the solutions are displayed with a "Solution" label, and (by default) in a smaller font to make it visually clear that it is the solution to the exercise.

Formatting of the solutions takes care, too, of numbering the equations differently (i.e. (S.1), (S.2), etc.) so equation numbering does not collide with the equation text and all equations have the same labels. Equations are also guaranteed to have the same labels between the exercise and solution versions of the sheet.

The `\begin{loesung}...\end{loesung}`(page 9) environment may appear anywhere in the exercise, and may be repeated. You may have, for example, one general solution at the end of the exercise, or multiple solutions after each exercise part or sub-exercise.

`\begin{loesung} ... \end{loesung}`

Solution to an exercise. The content of this environment is by default hidden, unless in 'solution sheet' mode (package option `sol`, or with the command `\UebungMakeSolutionsSheet`(page ??)). If in solution sheet mode, then the contents is formatted using a smaller font (by default) and is preceeded by the label "Solution" (or "Lösung" if the sheet is in german, with the `german` package option, see Sec.3.3).

Equations numbered within this environment obey a separate counter and their labels are preceeded by a letter "S" (resp "L" in German), i.e. (S.1), (S.2), ... (resp. (L.1), (L.2), ...), such that it is guaranteed that equation numbering stays consistent between solution sheet mode and exercise sheet mode.

`\begin{solution} ... \end{solution}`
Exactly the same as the `\begin{loesung}...\end{loesung}` environment.

[!] Both commands `\begin{loesung}...\end{loesung}` and `\begin{solution}...\end{solution}` display their label in the same language, which is the language of the exercise sheet. This defaults to English but may be set to German with the `german` package option (Sec. 3.3).

6 Customization

6.1 Customizing the Header

6.2 Customizing the `\begin{exenumerate}...\end{exenumerate}` environment

6.3 Customizing the Exercise Sheet Texts and Labels

title (ex/sol)

ex label and 'composition' ("Exercise", "Question" and/or "Exercise N.", "Question N.")

subexercise label and 'composition'

7 Some Internals

8 Commands Reference

`\UebungLecture`
Sets the title of your lecture. See page 4.

`\UebungProf`
Sets the name of the professor or lecturer of the course. See page 4.

`\UebungLecturer`
Same as `\UebungProf`(page 4). See page 4.

`\UebungSemester`
Sets the course semester. See page 4.

`\UebungsblattNumber`
Sets the current exercise sheet number. See page 4.

`\UebungsblattTitleSeries`
Set the title for the exercise sheet (when not in solutions mode). See page ??.

`\UebungsblattTitleSolutions`
Set the title for the solutions sheet (only when in solutions mode, i.e. with `[sol]` package option or with `\UebungMakeSolutionsSheet`(page ??)). See page ??.