ECE 20007

Lab 15

Example Report

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Contents

15.1 A quick introduction **2**
15.1.1 Basic editing 2
15.1.2 Document structure 2

15.2 Some more features **3**
15.2.1 Code blocks 3
15.2.2 Circuit diagrams 3
15.2.3 Plots 4
15.2.4 5

List of Circuits

1 Example Circuit 4

List of Plots

1 4

15.1 A quick introduction

15.1.1 Basic editing

Overleaf has written a much better guide than I would be able to – use `https://www.overleaf.com/learn/latex/Tutorials` to learn how to use LaTeX.

15.1.2 Document structure

This package provides task and subtask commands, which are analogous to (and implemented with) the section and subsection commands. For a typical paper, automatic section numbering is preferred. However, when following the lab manual, I preferred using the same section numbers. These commands make it easier to do that.

15.2 Some more features

Objective The objective command provides an easy way to label objectives. There is also an equivalent `\conclusion` command.

15.2.1 Code blocks

`\inputcode[listings options]{filename.ext}`

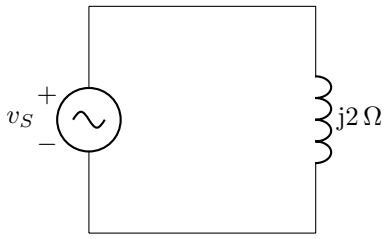
example.py

```python
import numpy as np
import matplotlib.pyplot as plt

# thevenin voltage and impedance
v = 4/5 + 2/5*1j
z = 1 - 1j

# range to test input load angle at
t = np.linspace(-np.pi,np.pi,1000)
# input load
l = np.absolute(z) * (np.cos(t) + 1j * np.sin(t))

# power to load
p = .5 * np.absolute(v / (z + l)) ** 2 * np.real(l)

print("degrees at max:", np.degrees(np.angle(l[np.argmax(p)])))
print("max value:", np.max(p))

plt.plot(t*180/np.pi, p)
plt.show()

with open("power", 'w') as data:
  for p in zip(t*180/np.pi, p):
    data.write(f"{p[0]} {p[1]}\n")
```

The `\inputcode` command provides an easy way to input format code files. This is implemented with the listings package (`https://ctan.org/pkg/listings`), and can be tweaked using its key-value system. The default language is set to Python.

15.2.2 Circuit diagrams

`https://ctan.org/pkg/circuitikz`

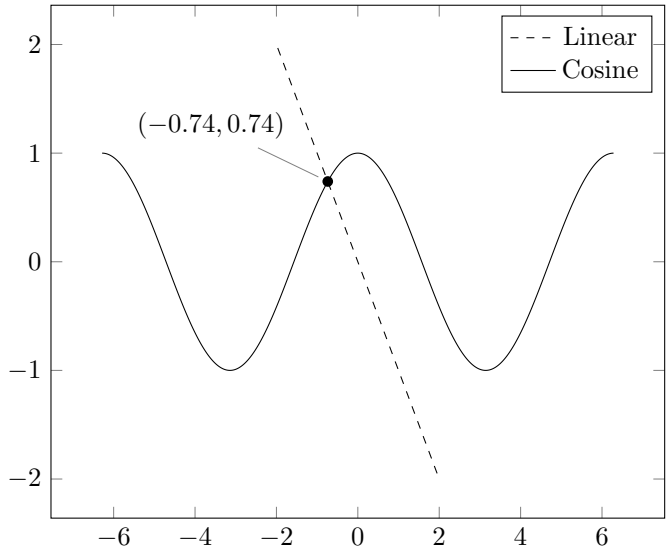


Circuit 1: Example Circuit

The `circuit` environment is a wrapper for the `circuitikz` environment from the corresponding package. The `circuit` environment sets the diagram to be centered, as well as adding support for `\caption[]{}`, `\label{}`, and `\autoref{}`. There is also a `\listofcircuits`. A starred environment is available that will not be added to the list. The links produced from autoref appear as Circuit 1

15.2.3 Plots

`https://ctan.org/pkg/pgfplots`



Plot 1

The `plot` environment is a wrapper for the `tikzpicture` environment, intended to be used with the `axis` environment to produce plots. The environment does not directly wrap the `axis` environment, to allow more advanced features such as two axes on the same graph. Similar to the `circuit` wrapper above, this adds support for `\caption[]{}`, `\label{}`, and `\autoref{}`, as well as having its own `\listofplots` with a corresponding starred environment. Note that

the caption and label commands must be outside of the axis environment, but inside the plot environment. The autoref links appear as Plot 1.

15.2.4

Other useful features include an error calculator accessed with `\error{actual}{expected}` and an effeciency calculator accessed with `\efficiency{useful}{total}`. Both of these commands print a number from 0 to 100 with two decimal places.