# ECE 20007

Lab 15

## Example Report

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## List of Circuits



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## 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}`

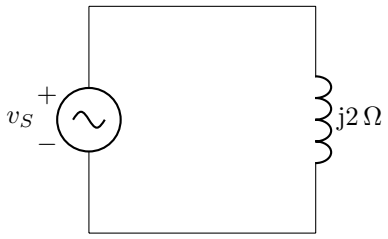
example.py

```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`

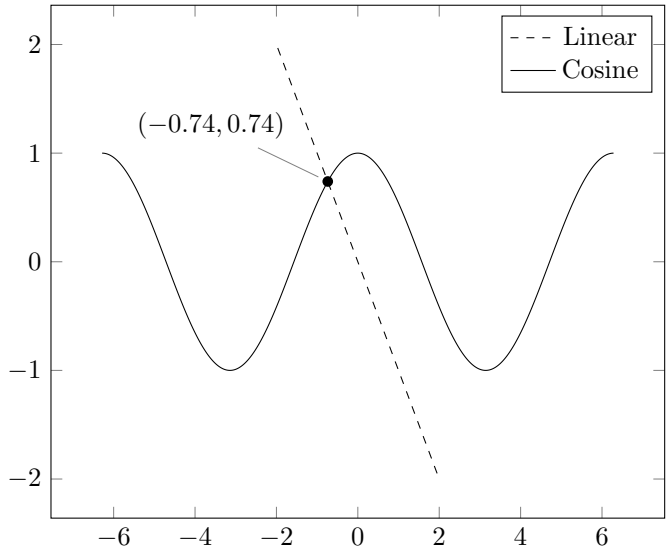



**Circuit 1:** Example Circuit

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.