Introduction to the **Dark Side** a.k.a.: *Electronics*

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- Philosophy
- Art
- Literature

Why those requirements are a milestone for us?

THE Question!!!
Which is the main reason for the development of Science and Technology?

There are two main answers:
First one is based on **to know**. *Why does it happened?, why this is occurring?, it is possible to see beyond?, it is possible to fly faster?, can we control our sun?,* $\cdots$
The second one is quite vulgar. We need to do or to develop such technology to sell it. Do not take me wrong, it is ok to be greedy, everyone need a Tesla Model S, it is just a bit vulgar.

Hands on... then

Electronics, nowadays, shape and is reshaping the world each single hour/day/minute.
It is divided in:

- ► Analog
- ► Digital
- ► Mix-Signal

Whole Electronics that we know, so far, are based on those.
It worth to mention that, each one, despite to follow the same "rules", behave in a completely different manner and its applications have specific characteristics.
Go to the basics.

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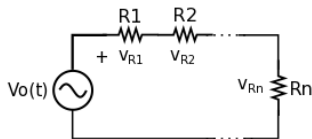- Ohm's law

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- Capacitance C = Q/V (C)
- Power P = VI or I^2R or V^2/R
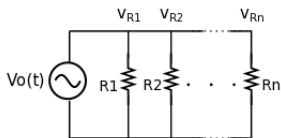
Net Circuits: parallel and series

There are two main Net circuits: series and parallel.
Series

In this configuration, current is the same in whole net but voltage.
It changes by element.
Parallel

In this configuration, current varies according to each net but
voltage is the same for all.

- Usually, electronic nets are a combination of series and parallel elements.
- The analysis for those has evolve and become a bit complex in order to solve such nets.
- There are two main methods to solve those circuits such as: Net analysis and node analysis.
- However, the key element to solve those is based on the experience and continue study.
- This is why, there is a "review" handout to solve a few problems.

Passive elements

In the beginning, there were three passive elements such as capacitance, resistance and inductance.

Those elements are linked one each other through the energy that drives i.e. R I $\Longleftrightarrow$ V, C V $\Longleftrightarrow$ Q, L I$\Longleftrightarrow$ Ψ as shown in Figure.
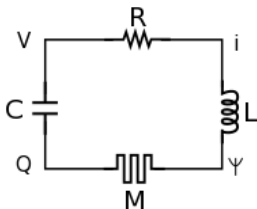
In the 1970s a scientist *Chua* theorised the existence of a passive element that can relate flux with charge... in early 2010 a team of Russian Scientist invented the first element known as **Memristor**.

Complex Nets

In order to solve complex nets, it is required to have a basic knowledge on Maths, Physics and common sense. We are going to review the basic maths required to solve it accordingly. There are two main ways: **Impedances** and **Reactances**

- Reactances: Inductive, Resistive and Capacitive
  Capacitive

$$\chi_C = \frac{1}{2\pi f C}$$

  Inductive

$$\chi_L = 2\pi f L$$

  Resistive

$$\chi_R = R$$

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- According to the device arrays and the source implemented, the obtained signal might behave as you wish if properly analysed or not.
- There are three main ways to "analyse" such nets: algebraically, numerically and by simulating it.

Overview

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- ▶ The *MOST* important, **Enjoy the ride** or perish.