INTRODUCTION TO ELECTRONICS

A basic overview into practical electronics

CONTENTS OF THE COURSE

Getting started with basic electronics is easier than you might think. This presentation will break down the basics of electronics so that anyone with an interest in building circuits can succeed.

Why do we need to learn electronics?

- **Electronics** develops the skills of logical and abstract thinking.
- With the right skills, you'll be able to build any device you invent like a simple robot or a remote control car

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To help you demonstrate familiarity with basic electronic components and use them to design simple electronic circuits

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MAJOR REQUIREMENTS

Your undivided attention and the ability to think outside the box.

03

PROJECT GOALS

To recognize a variety of exciting high-tech products and systems enabled by electronics

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SNEAK PEEK

“It is very important to prevent short circuits by making sure that the positive voltage is never wired directly to ground.”

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PROJECT STAGES

We will begin with the concept of electricity and end with a small innovation made by you

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OUR TEAM

Taught by our Project Specialist, Mr. Birakumar
Presentation by Innovation Coordinator, Marina S

OUR COMPANY-
INNOVATION HUB MANIPUR

The Innovation Hub, Manipur is first of its kind in the state.

It is in effect, a research and development venture where the state can showcase and promote its ingenuity and be a contributive member in the world of computers.

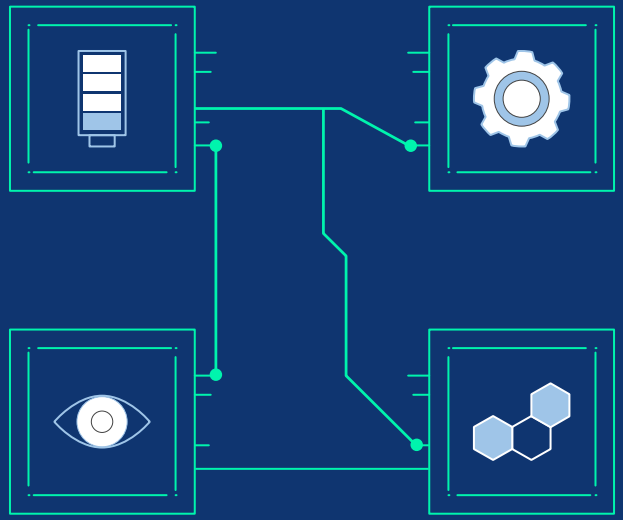
WHAT WE ARE WORKING ON

ARTIFICIAL INTELLIGENCE

refers to the simulation of human intelligence in machines

INTERNET OF THINGS

system of technologies connected over a wireless network to collect and transfer data



ROBOTICS

Designing machines to help and assist humans

MIND ROOM

Platform to exchange ideas among members of related fields

ABOUT THE PROJECT

After studying this course, you should be able to:

- recognize a variety of exciting high-tech products and systems enabled by electronics
- manipulate voltages, currents and resistances in electronic circuits
- demonstrate familiarity with basic electronic components and use them to design simple electronic circuits

“Electronics are getting more and more accessible now - you don't have to be an engineer to start building things”

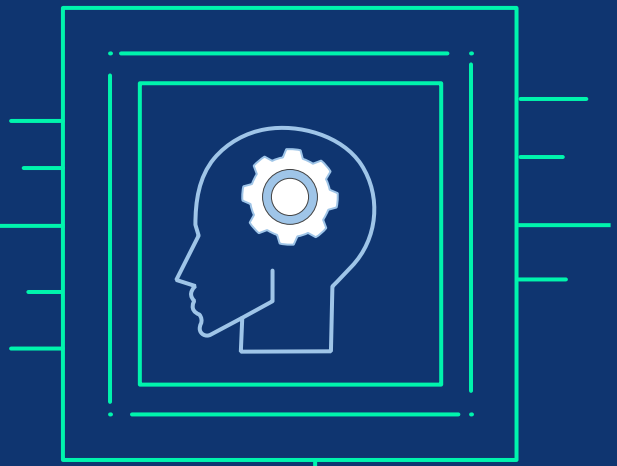
—SIMONE GIERTZ

1. ELECTRICITY

Electricity is the presence and flow of **electric** charge.

There are two types of electrical signals:
alternating current (AC), and direct current (DC).

- **AC**, in which flow of electric charge periodically reverses.
- **DC** is the unidirectional flow of electric charge



BASICS OF ELECTRICITY

The three basic principles can be explained using electrons, or more specifically, the charge they create:

- Voltage is the difference in charge between two points.
- Current is the rate at which charge is flowing.
- Resistance is a material's tendency to resist the flow of charge (current).

02. CIRCUITS

A circuit is a complete and closed path through which electric current can flow

A closed circuit would allow the flow of electricity between power and ground.

An open circuit would break the flow of electricity between power and ground

03. RESISTANCE

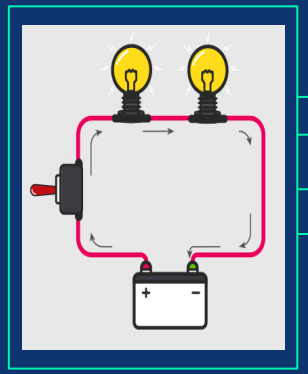
Resistance is a measure of the opposition to current flow in an electrical circuit.

Resistance is measured in ohms, symbolized by the Greek letter omega (Ω).

Ohms are named after Georg Simon Ohm (1784-1854), a German physicist who studied the relationship between voltage, current and resistance.

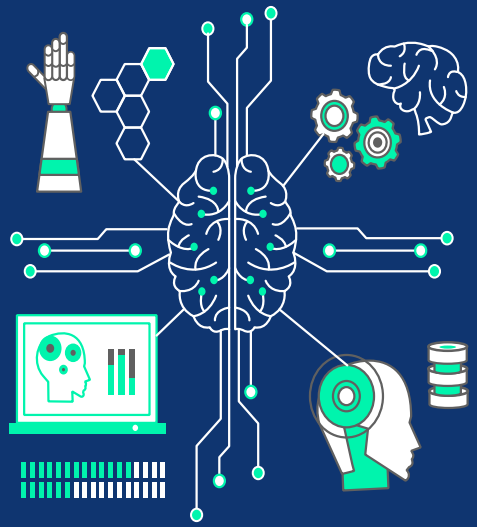
04. SERIES VS PARALLEL

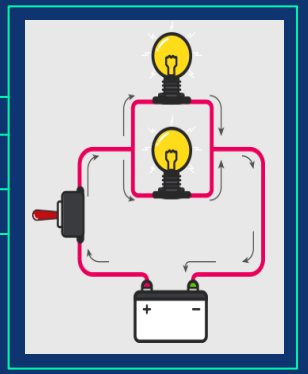
There are two different ways in which you can wire things together called series and parallel.



SERIES

When things are wired in series, things are wired one after another, such that electricity has to pass through one thing, then the next thing, then the next, and so on.





PARALLEL

When things are wired in parallel, they are wired side by side, such that electricity passes through all of them at the same time, from one common point to another common point

05. BASIC COMPONENTS

Resistors

They add resistance to the circuit and reduces the flow of electrical current.

These values are measured in ohms.

Capacitors

It is a component that stores electricity and then discharges it into the circuit when there is a drop in electricity.

Capacitors are measured in Farads.

Transistors

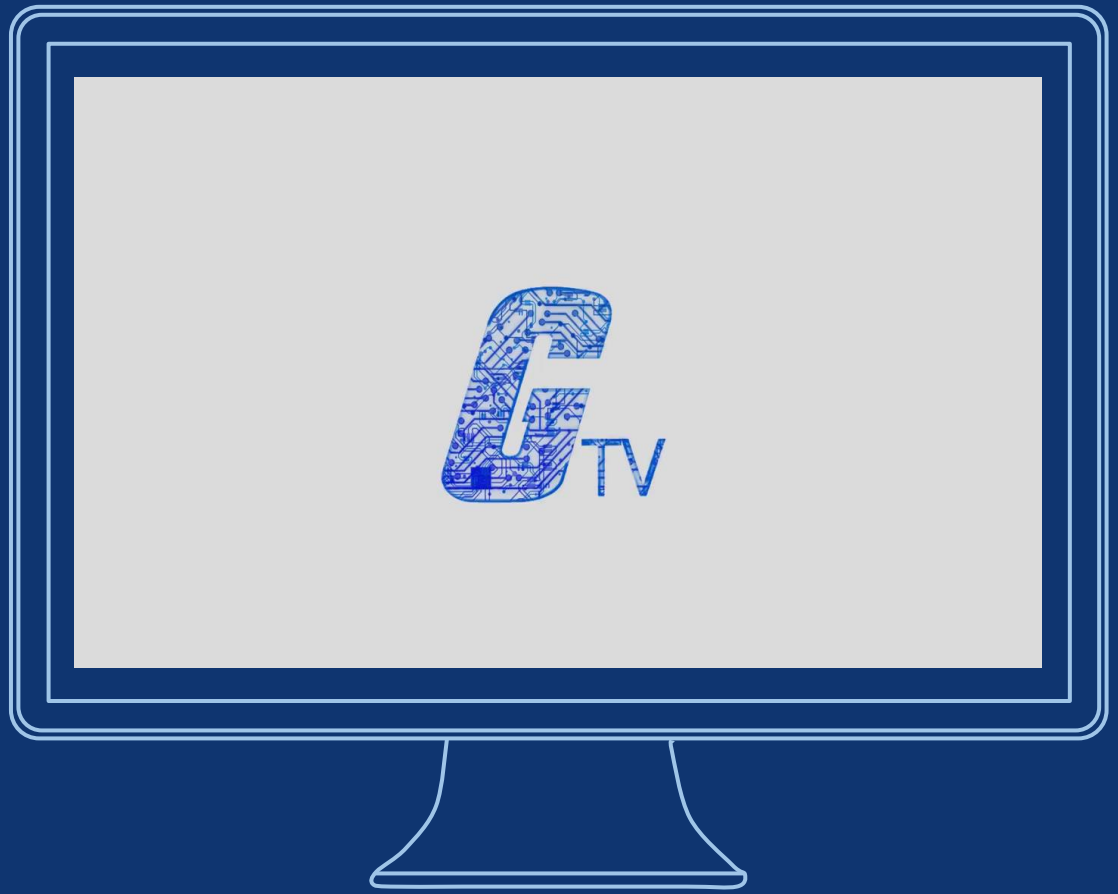
A transistor takes in a small electrical current at its base pin and amplifies it.

There are two basic types of transistors, which are NPN and PNP.

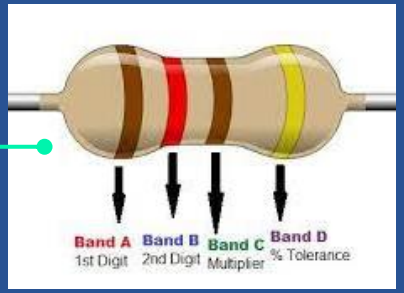
Diodes

Diodes are components which are polarized. They only allow electrical current to pass through them in one direction.

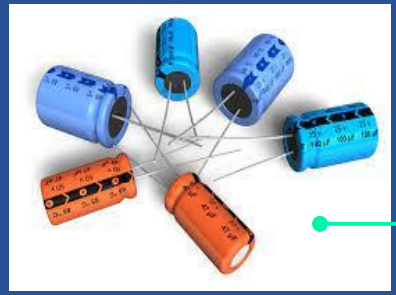
They are represented in schematic as a line with a triangle pointing at it



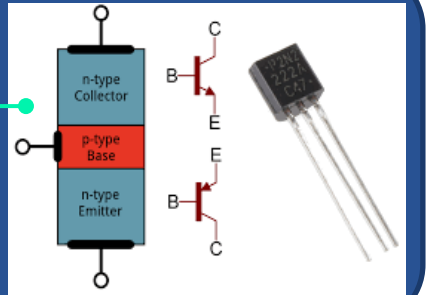
Resistor



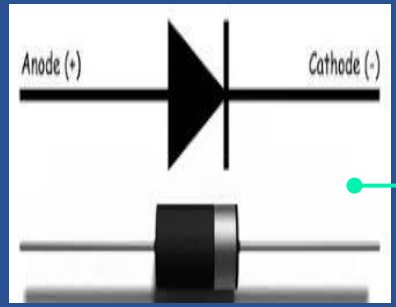
Capacitor



Transistor



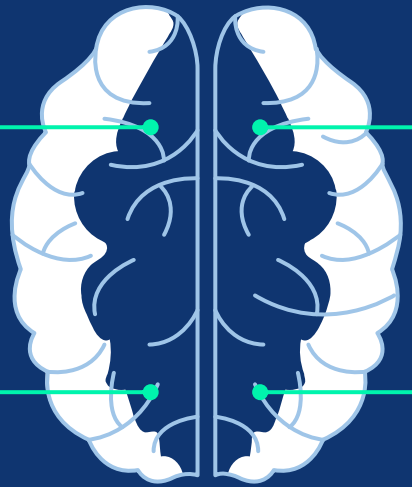
Diode



06. INTEGRATED CIRCUITS

It is an entirely specialized circuit that has been miniaturized and fit onto one small chip.

Integrated circuits come in a variety of di8erent shapes and sizes.

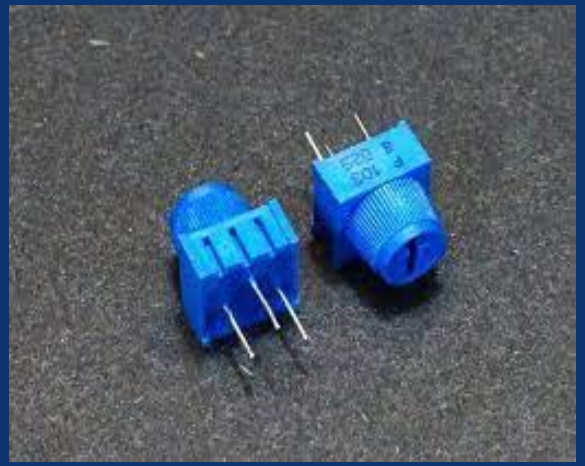


These miniaturized circuits typically consist of components such as transistors, resistors, and diodes

There is no standard way that all ICs are incorporated into circuit diagrams, often represented as boxes with numbers in them

07. Potentiometers

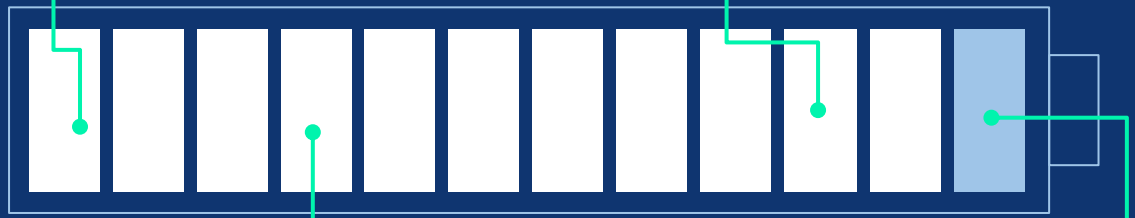
- Potentiometers are variable resistors.
- Potentiometers are measured in ohms like resistors, but rather than having color bands, they have their value rating written directly on them
- Potentiometers have three legs as to create a voltage divider, which is basically two resistors in series



08. LEDS

LED stands for light emitting diode. It is basically a special type of diode that lights up when electricity passes through it.

Like all diodes, the LED is polarized and electricity is only intended to pass through in one direction.

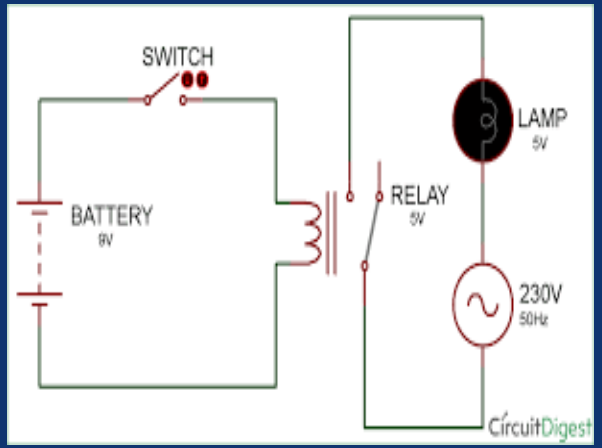


Like all diodes, LEDs create a voltage drop in the circuit, but typically do not add much resistance.

LEDs will show up in a schematic as a diode symbol with lightning bolts coming o8 of it, to indicate that it is a glowing diode.

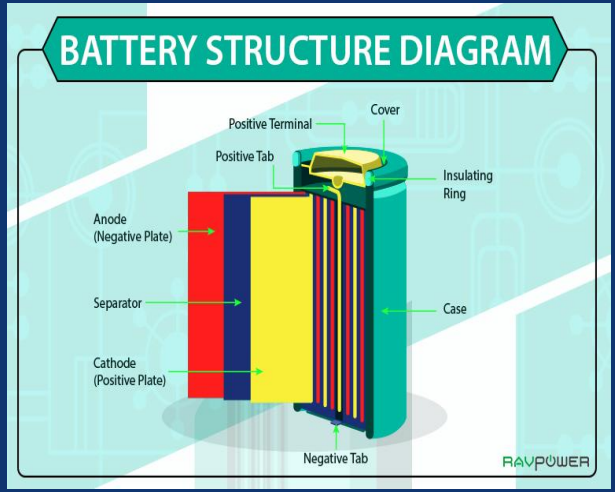
09. SWITCHES

- A switch is basically a mechanical device that creates a break in a circuit.
- When you activate the switch, it opens or closes the circuit.
- Normally open (N.O.) switches close the circuit when activated.
- Normally closed (N.C.) switches open the circuit when activated.
- As switches get more complex they can both open one connection and close another when activated.



10. BATTERIES

- A battery is a container which converts chemical energy into electricity.
- Batteries are represented in a circuit by a series of alternating lines of di8erent length. There are also additional marking for power, ground and the voltage rating.
- By placing batteries in series you are adding the voltage of each consecutive battery, but the current stays the same.
- By placing batteries in parallel the voltage remains the same, but the amount of current available doubles



11. BREADBOARDS

- Breadboards are special boards for prototyping electronics. They are covered with a grid of holes, which are split into electrically continuous rows.
- In the central part there are two columns of rows that are side-by-side.
- On each edge of the breadboard, there typically runs two continuous bus lines.

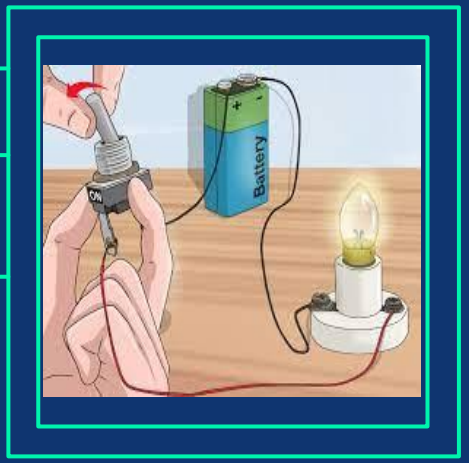
12. WIRE

In order to connect things together using a breadboard, you either need to use a component or a wire.

Wires are nice because they allow you to connect things without adding virtually no resistance to the circuit.

This allows you to be flexible as to where you place parts because you can connect them together later with wire.

It also allows you to connect a part to multiple other parts.

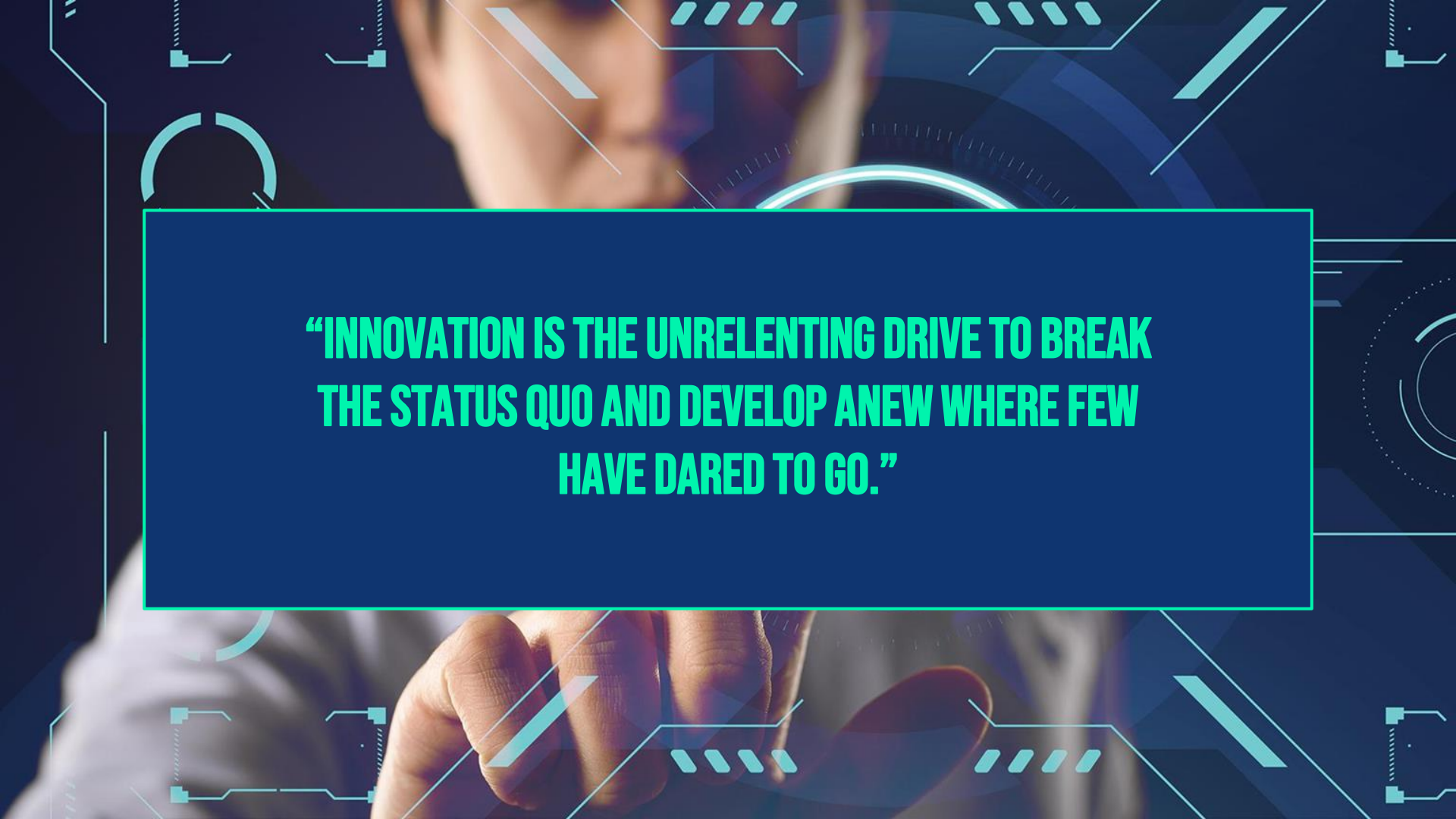


YOUR FIRST CIRCUIT

Parts List:

- 1K ohm - 1/4 Watt resistor
- 5mm red LED
- SPST toggle switch
- 9V battery connector

The 1K resistor, LED, and switch are all connected in series with the 9V battery. When you build the circuit, you will be able to turn the LED on and off with the switch.


“INNOVATION IS THE UNRELENTING DRIVE TO BREAK THE STATUS QUO AND DEVELOP ANEW WHERE FEW HAVE DARED TO GO.”

THANKS!

Do you have any questions?

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