

## 4 ELECTRONICS FUNDAMENTALS

Whether you're a curious hobbyist or aspiring engineer, learning the fundamentals of electronics is a crucial step towards understanding and building robots. Electronics is the backbone of robotic systems, providing the necessary control and communication between various components.

In this introduction, we'll explore the basic concepts of electronics that are essential for robotics. We'll cover topics such as circuits, components, sensors, actuators, and microcontrollers. By the end of this guide, you'll have a solid foundation to dive deeper into the world of robotics.

**Components:** Electronic components are the building blocks of circuits. Resistors control the flow of current, capacitors store electrical charge, and diodes allow current to flow in only one direction. Other components, like transistors and integrated circuits (ICs), provide amplification and complex functionalities. Familiarizing yourself with these components will enable you to construct and manipulate electronic circuits.

**Circuits:** At the heart of electronics lies the concept of circuits. A circuit is a path through which electric current flows. It consists of various components, such as resistors, capacitors, and diodes, connected by conductive wires. Understanding how circuits work is vital to designing and troubleshooting robotic systems. Central to understanding and designing these systems are the basic principles of electricity and electronics. In next chapters we will dive these principles, focusing on:

1. Ohm's Law,
2. Kirchhoff's Current Rule and
3. Kirchhoff's Voltage Rule,

and illustrates each with practical examples relevant to robotic device.

**Reading sensor's values:** Sensors are essential for robots to perceive their environment. They convert physical quantities, such as temperature, light, sound, or distance, into electrical signals. Common types of sensors include proximity sensors, temperature sensors, accelerometers, and cameras. By integrating sensors into your robot, you can gather valuable data to make informed decisions and enable autonomous behavior.

**Controlling Actuators:** Actuators are responsible for physical movement in robots. They convert electrical energy into mechanical motion. Examples of actuators include motors, servos, solenoids, and pneumatics. Actuators allow robots to perform tasks such as locomotion, gripping objects, or manipulating their environment. Understanding how to control and interface with actuators is crucial for creating dynamic and interactive robots.

**Microcontrollers:** Microcontrollers are the brains of many robotic systems. They are small, programmable devices that provide computing power and control to robots. Microcontrollers can read sensor inputs, process data, and send commands to actuators. Arduino and Raspberry Pi are popular

microcontroller platforms used in robotics. Learning to program microcontrollers will unlock endless possibilities for your robotic creations.

As you embark on your journey into robotics, keep in mind that electronics is a vast and evolving field. It requires a combination of theoretical knowledge and hands-on experience. Experimentation and continuous learning will be your allies in mastering electronics fundamentals in robotics.

Now that you have a glimpse into the foundational aspects of electronics for robotics, you're ready to dive deeper into each topic. Explore tutorials, online resources, and hands-on projects to further expand your knowledge. The more you learn and practice, the more you'll be able to bring your robotic ideas to life.

Remember, robotics is an exciting and interdisciplinary field that combines electronics, mechanics, programming, and more. So, have fun, stay curious, and let your creativity guide you as you explore the world of robotics!