

Introduction

Understanding electricity and its role in our society is a good first step to studying our environmental impact and finding ways to reduce our footprint. To do this, we first need to re-examine our relationship with electricity and its sources.

Electricity is a natural phenomenon that can be used to power electronic equipment and devices. Everything on the planet is made of atoms, and all atoms have electrons. Basically, electricity is the flow of electrons from one atom to another. We call this flow the "current" (or "electric current"). Atoms that easily exchange electrons are called conductors. These conductors can be combined to enable us to control the flow of electricity to serve our needs. Sources of electricity fall into two categories: renewable (such as solar energy) and non-renewable (oil). The world's three main sources of electricity - coal, gas and oil - are non-renewable. Other widespread sources of electricity are nuclear, hydroelectric, wind and solar power.

In this course, we'll answer some of the most frequently asked questions about electricity, and define some commonly used physical quantities such as electric field, electric force and electric potential.

The course is divided into four chapters. Chapter 1 introduces the basics of electrostatics, defining coulomb forces, the electrostatic field and electrostatic potential. Chapter 2 is devoted to Gauss's theorem with various applications, including the calculation of the electric field of spheres, cylinders and conducting wires. Equilibrium conductors are the subject of Chapter 3. This chapter defines the different types of capacitors, with all the calculations that go with them. The final chapter covers the fundamentals of electrokinetics, focusing on Ohm's and Kirchhoff's laws for circuit study and understanding.