



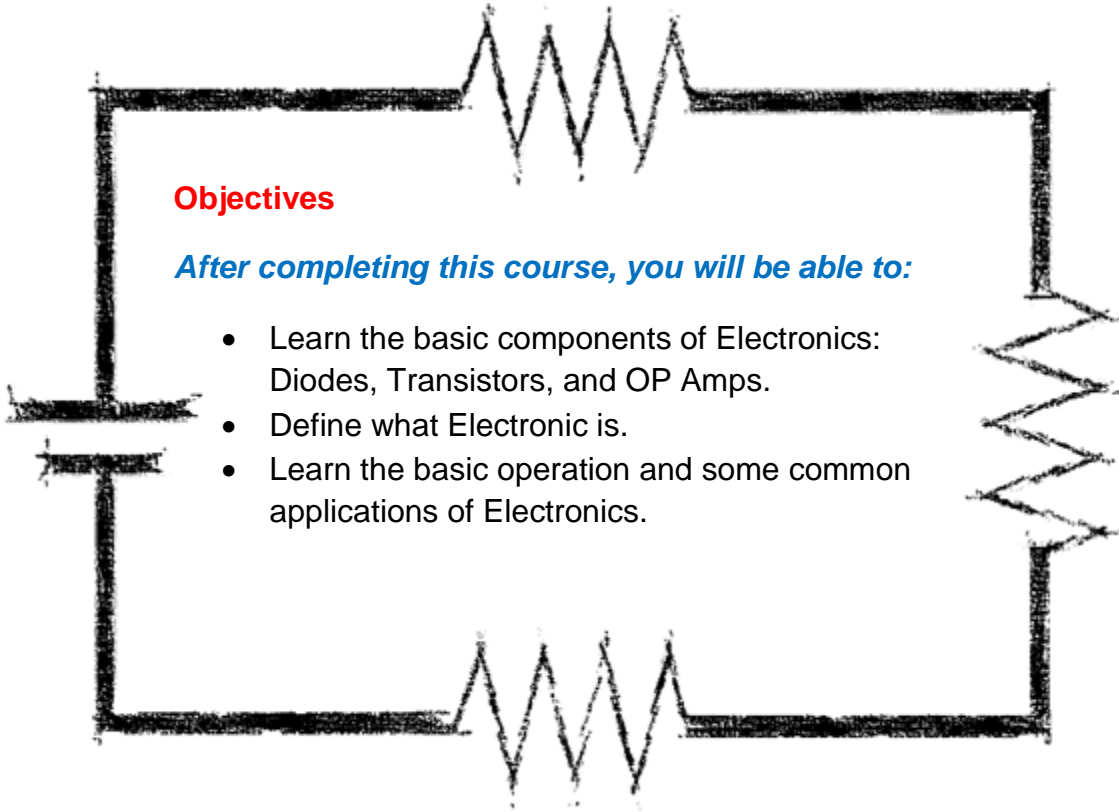
CHAPTER 1

INTRODUCTION TO ELECTRONICS

Objectives

After completing this course, you will be able to:

- Learn the basic components of Electronics: Diodes, Transistors, and OP Amps.
- Define what Electronic is.
- Learn the basic operation and some common applications of Electronics.



Electronics

- comprises the physics, engineering, technology and applications that deal with the emission, flow and control of electrons in vacuum and matter.
- uses active devices to control electron flow by amplification and rectification, which distinguishes it from classical electrical engineering which uses passive effects such as resistance, capacitance and inductance to control current flow. Electronics has had a major effect on the development of modern society.
- The identification of the electron in 1897, along with the subsequent invention of the vacuum tube which could amplify and rectify small electrical signals, inaugurated the field of electronics and the electron age.
- This distinction started around 1906 with the invention by Lee De Forest of the triode, which made electrical amplification of weak radio signals and audio signals possible with a non-mechanical device. Until 1950, this field was called "radio technology" because its principal application was the design and theory of radio transmitters, receivers, and vacuum tubes.
- The term "solid-state electronics" emerged after the first working transistor was invented by William Shockley, Walter Houser Brattain and John Bardeen at Bell Labs in 1947.
- The MOSFET (MOS transistor) was later invented by Mohamed Atalla and Dawon Kahng at Bell Labs in 1959.
- The MOSFET was the first truly compact transistor that could be miniaturised and mass-produced for a wide range of uses, revolutionizing the electronics industry, and playing a central role in the microelectronics revolution and Digital Revolution.
- The MOSFET has since become the basic element in most modern electronic equipment, and is the most widely used electronic device in the world.
- The ability of electronic devices to act as switches makes digital information-processing possible.
- Interconnection technologies such as circuit boards, electronics packaging technology, and other varied forms of communication infrastructure complete circuit functionality and transform the mixed electronic components into a regular working system, called an electronic system; examples are computers or control systems.
- An electronic system may be a component of another engineered system or a standalone device. As of 2019 most electronic devices use semiconductor components to perform electron control.
- The study of semiconductor devices and related technology is considered a branch of solid-state physics, whereas the design and construction of electronic circuits to solve practical problems come under electronics engineering. This article focuses on engineering aspects of electronics

Noise

- Electronic noise is defined as unwanted disturbances superposed on a useful signal that tend to obscure its information content.
- Noise is not the same as signal distortion caused by a circuit. Noise is associated with all electronic circuits. Noise may be electromagnetically or thermally generated, which can be decreased by lowering the operating temperature of the circuit.
- Other types of noise, such as shot noise cannot be removed as they are due to limitations in physical properties.

Digital electronics

- is a field of electronics involving the study of digital signals and the engineering of devices that use or produce them. This is in contrast to analog electronics and analog signals.
- Digital electronic circuits are usually made from large assemblies of logic gates, often packaged in integrated circuits.
- Complex devices may have simple electronic representations of Boolean logic functions.

Analogue electronics

- are electronic systems with a continuously variable signal, in contrast to digital electronics where signals usually take only two levels. The term "analogue" describes the proportional relationship between a signal and a voltage or current that represents the signal. The word analogue is derived from the Greek word ανάλογος (analogos) meaning "proportional".

Microelectronics

- is a subfield of electronics. As the name suggests, microelectronics relates to the study and manufacture (or microfabrication) of very small electronic designs and components. Usually, but not always, this means micrometre-scale or smaller. These devices are typically made from semiconductor materials. Many components of normal electronic design are available in a microelectronic equivalent. These include transistors, capacitors, inductors, resistors, diodes and (naturally) insulators and conductors can all be found in microelectronic devices. Unique wiring techniques such as wire bonding are also often used in microelectronics because of the unusually small size of the components, leads and pads. This technique requires specialized equipment and is expensive.

Optoelectronics

- is the study and application of electronic devices and systems that source, detect and control light, usually considered a sub-field of photonics. In this context, light often includes invisible forms of radiation such as gamma rays, X-rays, ultraviolet and infrared, in addition to visible light.

Semiconductor device

- is an electronic component that relies on the electronic properties of a semiconductor material (primarily silicon, germanium, and gallium arsenide, as well as organic semiconductors) for its function. Semiconductor devices have replaced vacuum tubes in most applications.

Embedded system

- a combination of a computer processor, computer memory, and input/output peripheral devices—that has a dedicated function within a larger mechanical or electrical system.

Audio electronics

- is the implementation of electronic circuit designs to perform conversions of sound/pressure wave signals to electrical signals, or vice versa. Electronic circuits considered a part of audio electronics may also be designed to achieve certain signal processing operations, in order to make particular alterations to the signal while it is in the electrical form.

Telecommunication

- (from Latin communicatio, referring to the social process of information exchange, and the Greek prefix tele-, meaning distance) is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems

Nanoelectronics

- refers to the use of nanotechnology in electronic components. The term covers a diverse set of devices and materials, with the common characteristic that they are so small that inter-atomic interactions and quantum mechanical properties need to be studied extensively.

Video links:

Beginner Electronics - 1 - Introduction

- <https://www.youtube.com/watch?v=r-X9coYTOV4&list=PLah6faXAgguOeMUlXS22ZU4w5nDvCI5gs>

Beginner Electronics - 2 - AC vs. DC

- <https://www.youtube.com/watch?v=r3MFuAdkHEM&list=PLah6faXAgguOeMUlXS22ZU4w5nDvCI5gs&index=2>

Beginner Electronics - 3 – Closed/Open Circuits

- <https://www.youtube.com/watch?v=-HplzM11xJI&list=PLah6faXAgguOeMUlXS22ZU4w5nDvCI5gs&index=3>

Beginner Electronics - 4 – Flow + Resistance

- <https://www.youtube.com/watch?v=PqjwxoUa9Z4&list=PLah6faXAgguOeMUlXS22ZU4w5nDvCI5gs&index=4>

Reference:

- "electronics | Devices, Facts, & History". *Encyclopedia Britannica*. Retrieved 19 September 2018.
- ^ "October 1897: The Discovery of the Electron". Retrieved 19 September 2018.
- ^ Floyd, Thomas L. (2017). *Electronics fundamentals : circuits, devices, and applications*. ISBN 978-1-292-23880-7. OCLC 101696629