Chapter-1
Electronics Drawing Techniques

1.1 Introduction

- The design of electronic circuits passes by several steps: the development of the basic idea, simulation of the circuit's functioning, printed circuit board creation, component placement and soldering, testing and troubleshooting.
- The design of electronic circuits enables students to put into practice the knowledge they have acquired in the field of electronics during their studies by implementing analog or digital electronic functions on printed circuits.
- The assembly of electronic components is defined by an electrical diagram called "layout diagram" or "placement diagram"

Figure-1 : Examples of electronic components

1.2 Some basic definitions

1.2.1 Electric circuit: It is a circuit composed of electrical devices connected to each other, according to an electrical diagram, by conductive wires ensuring the flow of an electric current (referred to as high current (10-12 A)).

1.2.2 Electronic circuit : It is a circuit composed of electronic devices (components) connected to each other, according to an electrical diagram, by conductors ensuring the flow of an electric current (referred to as low current (a few µA up to 1A), having the concept of controlling the flow of electrons through an electrical signal.

1.2.3 Electronic components: "It is a device intended to be assembled, according to an electrical diagram, with other devices to perform one or more electronic functions."

1.2.3.1 Passive component : It is a component that adheres to the generalized Ohm's law and cannot increase the power of the circuit (reduces the power of the circuit through the Joule effect).

1.2.3.2 Active component : It is a component that can contribute to to boosting the power of a circuit, which is recovered by its power supply. The majority of active components are semiconductor components.

1.2.3.3 Module: It is a mini-circuit composed of passive and active components, increasingly used in electronic devices. It is considered as an active component (e.g., memory card, sound card ...).

1.2.4 Electronic Function: Is a task that can be performed when several electronic components are assembled using a given electrical diagram (i.e. audio amplifier, a mouse …).

1.3 An overview of electronic components

- Electronic components are devices designated to be assembled with others to perform one or more electronic functions.
- They are presented in various types and categories to meet the technological requirements of the industry, both in terms of their electrical characteristics and their geometric shapes.

1.3.1 Classification of electronic components

Electronic components can be classified into different categories according to various criteria such as : geometric shapes, number of pins, field of applications, electrical characteristics, etc. (See Table-1 below).

Table-1 : Classification criteria for electronic components :

Classification criteria	Geometric shapes	Number of pins	Application Fields	Electrical characteristics
Exemples of components	- Discrete / Integrated - Traversing component / Surface Mounted Component (SMC) - Wrapper component	- Dipole: R, C, L, etc… - Tripole : Tr, Potentiometer - Quadripole: Optocoupler, transformer, Diode bridge" or Bridge rectifier. - Multi-pins : IC, Microprocessor,	- Analog / Digital - Electronics / Power Electronics.	- Passive / Active / Module (mixed mini-circuit)

1.3.2 Types of electronic components

There are three types of electronic components in the market: Standard Component, Company Component, and Customer Component. (See Table-2 below).

Table-2 : Different types of electronic components

Component Types	Standard	Company	Customer
Examples	- Manufactured by many manufacturers - Listed in catalogs - Can be replaced by an equivalent component - Can be easily identified	- Manufactured by one manufacturer - Does not always have an equivalent - Its identification is done using an alphanumeric code unique to each manufacturer	- Manufactured by one or more manufacturers for a single customer according to specifications demanded by the customer. - Its identification is determined by the customer's choice. - Its origin is unknown.

1.3.3 Electronic components Code

We have three coding systems for electronic components: American standard, Japanese standard, and European standard. (See Table-3 below).

Coding System	American Standard	Japanese Standard	European Standard
Naming & Abbreviation	Joint Electron Device Engineering Council (JEDEC)	Japanese Industrial Standard (JIS)	Pro-Elctron

1.3.4 Fundamental quantities Vs fundamental components

- There are four fundamental quantities which are; Voltage (V/v), Current (I/i), Charge (Q/q), and Flux (Φ/φ).
- We have six ways to relate between these quantities; four in proportional form and two in temporal variations form.
  - **Proportional formes ;**

$$R = \frac{V}{I} \; ou \; \frac{dv(t)}{di(t)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$C = \frac{Q}{V} \; ou \; \frac{dq(t)}{dv(t)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

$$L = \frac{\emptyset}{I} \; ou \; \frac{d\phi(t)}{di(t)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

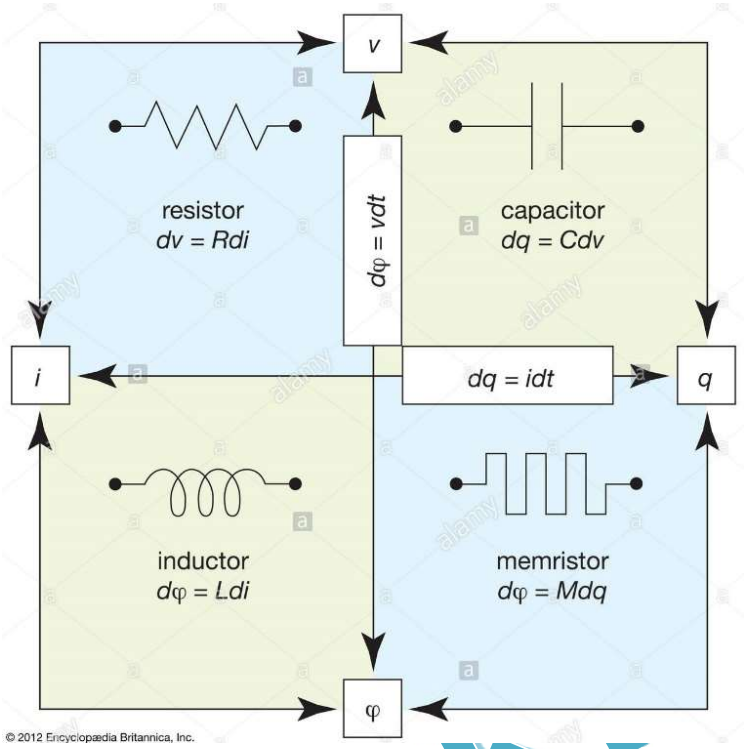
$$M = \frac{d\phi(t)}{dq(t)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

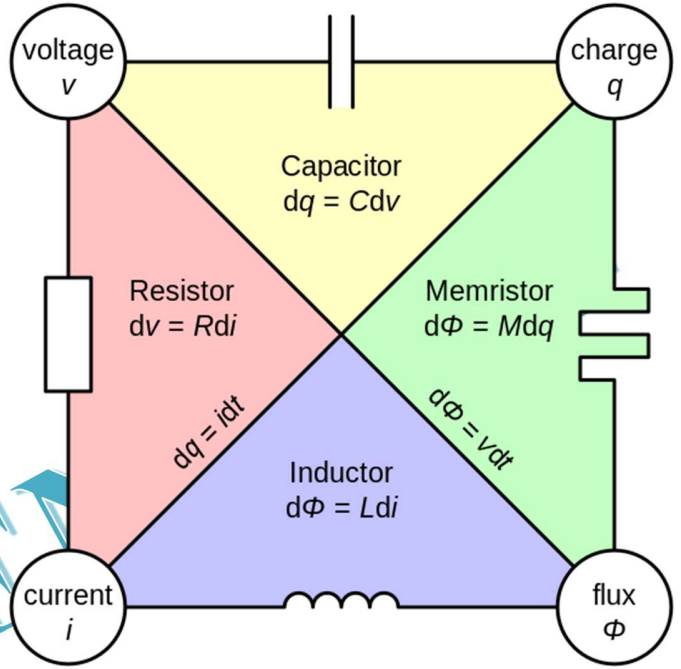
  - **Temporal variations formes ;**

$$v(t) = \frac{d\phi(t)}{dt} \Rightarrow d\phi(t) = v(t).dt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

$$i(t) = \frac{dq}{dt} \Rightarrow dq(t) = i(t).dt \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

- Fundamental components are components that can relate between fundamental quantities.
- Fundamental components are ;
  - Resistance (R)
  - Capacitor (C)
  - Inductor (L)
  - Memristance (M)





Home Work : Conduct a bibliographic research on memristors.