SNS COLLEGE OF TECHNOLOGY

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COIMBATORE-35
Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade
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19EET101 / BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING
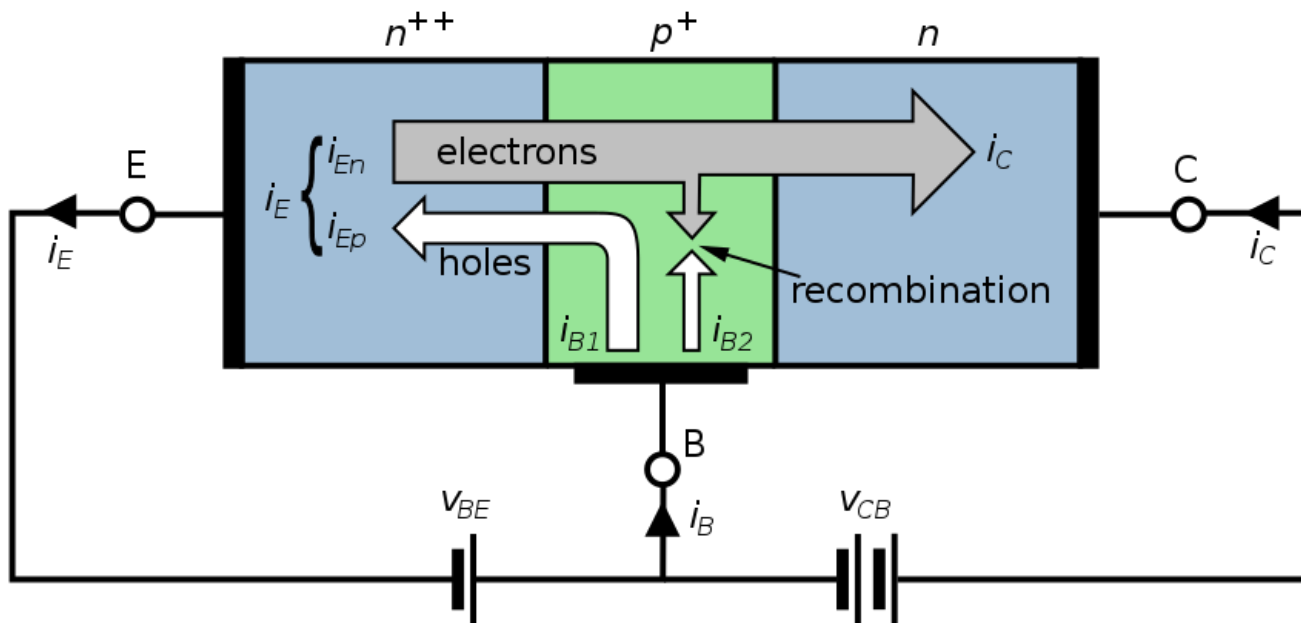# I YEAR / I SEMESTER

UNIT-IV: ANALOG ELECTRONICS

BJT

TOPIC OUTLINE

- ✓ Introduction
- ✓ Working principle
- ✓ VI characteristics
- ✓ Applications

Introduction

A **Bipolar Junction Transistor (BJT)** is a current-controlled semiconductor device which has three-terminals. The current in BJT is carried by both majority and minority carriers so it is known as bipolar device. The input resistance of BJT is low so it is used as an amplifier, oscillator circuits and digital circuits.
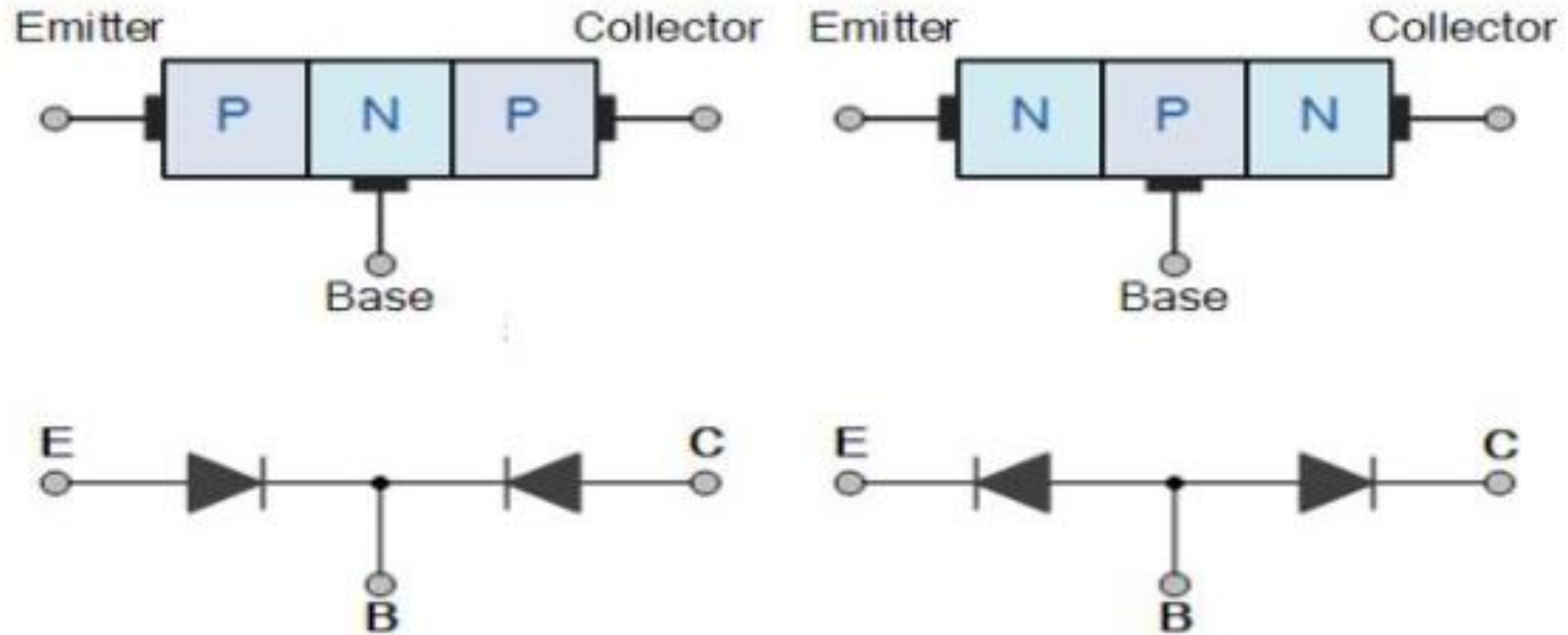
Basic Construction of BJT

A BJT consists of two pn junctions so it is analogous to two back to back connected diodes as shown in fig 1.1. A transistor is classified into two types based on its construction.

1. NPN Transistor
2. PNP Transistor

A transistor in which a thin layer of n-type semiconductor is sandwiched between two layers of p-type semiconductor is known as **PNP transistor**. In PNP transistor charge carriers are holes.

A transistor in which a thin layer of p-type semiconductor is sandwiched between two layers of n-type semiconductor is known as **NPN transistor**. In NPN transistor charge carriers are electrons.
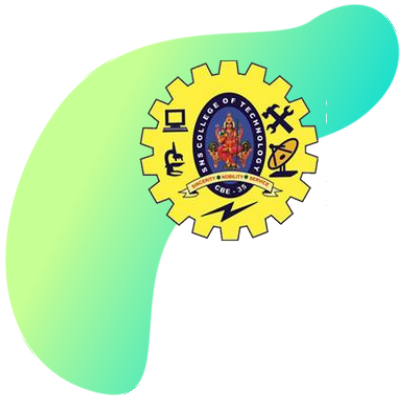
Basic Construction of Transistor

- Output current can toggle between large and small

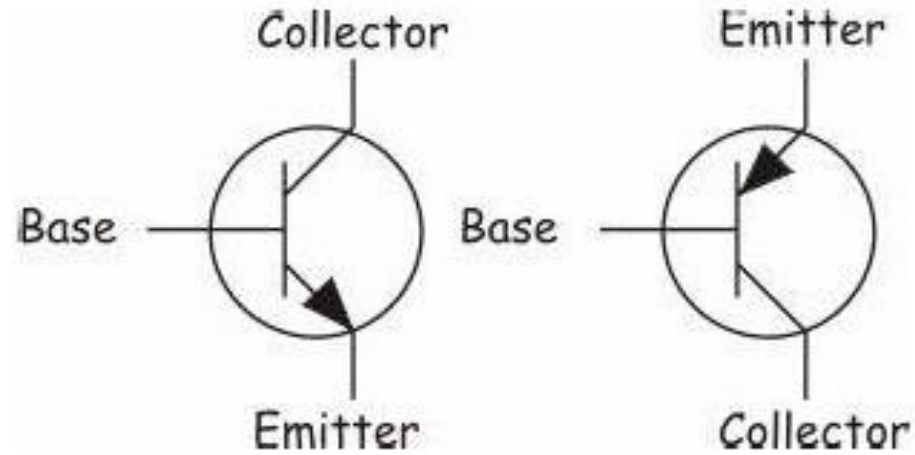 (Switching → Digital logic; create 0s and 1s)

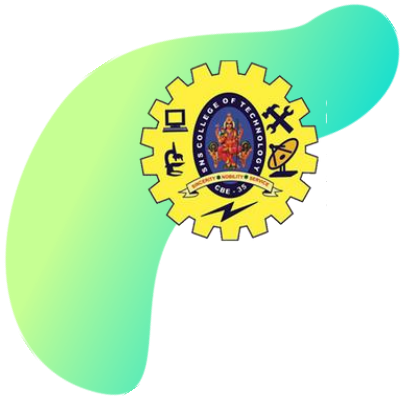- Small change in 'valve' (3rd terminal) creates Large change in output between 1st and 2nd terminal
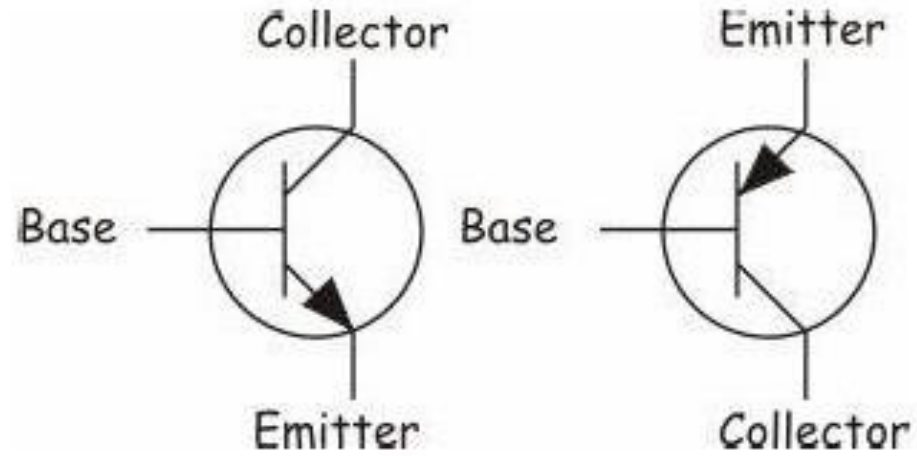
  (Amplification → Analog applications; Turn 0.5 → 50)

Symbols

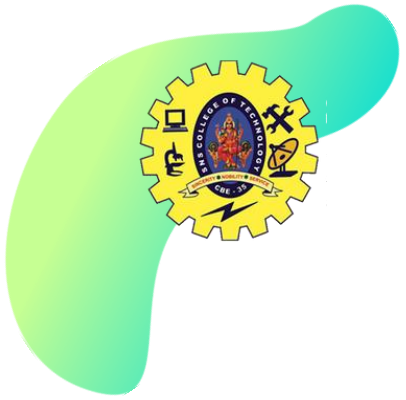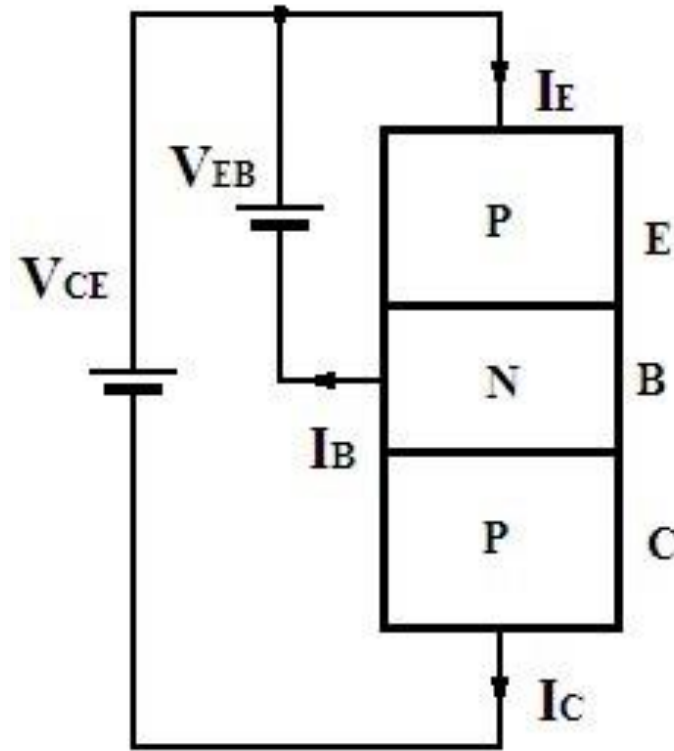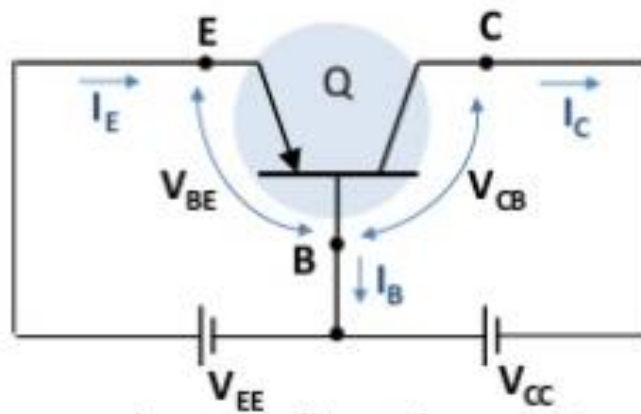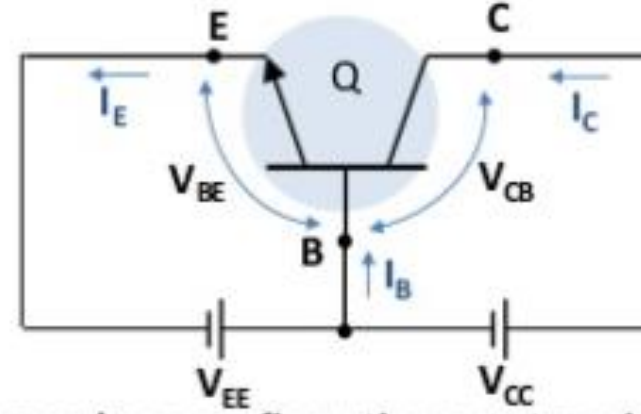# Symbols

Equivalent Circuit of BJT

BJT: Common Base configuration

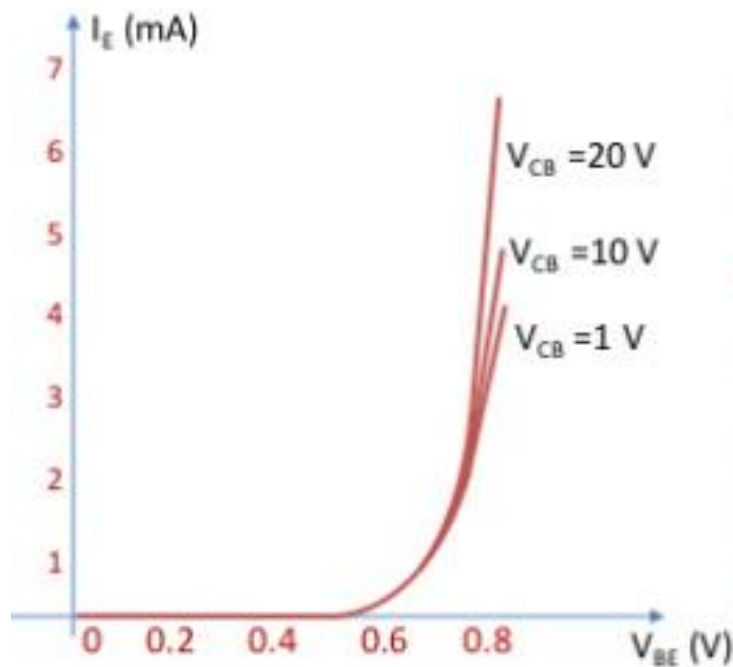Common base configuration pnp transistor   Common base configuration npn transistor

- Behaviour of BJT is described by two sets of characteristics; driving point or input parameters and output parameters.

- The input set for the CB amplifier relates an input current (I_E) to an input voltage (V_{BE}) for various levels of output voltage (V_{CB}).

- The output set for the CB amplifier relates an output current (I_C) to an output voltage (V_{CB}) for various levels of input current (I_E).
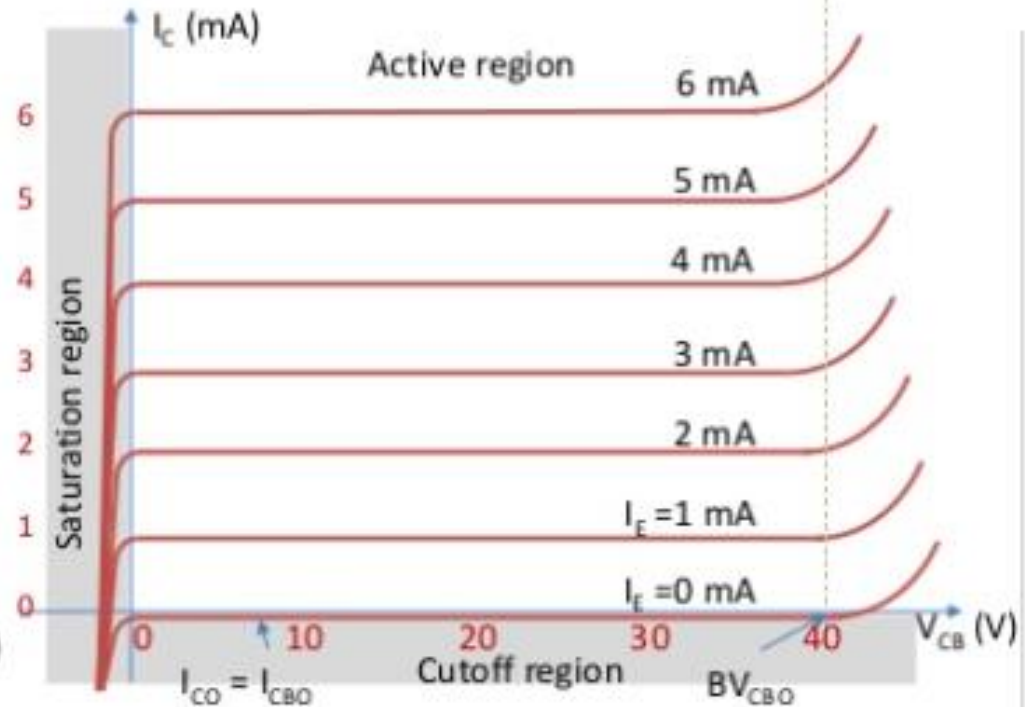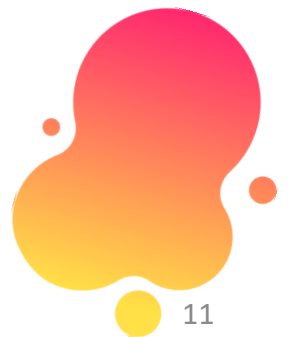
BJT: Common Base configuration

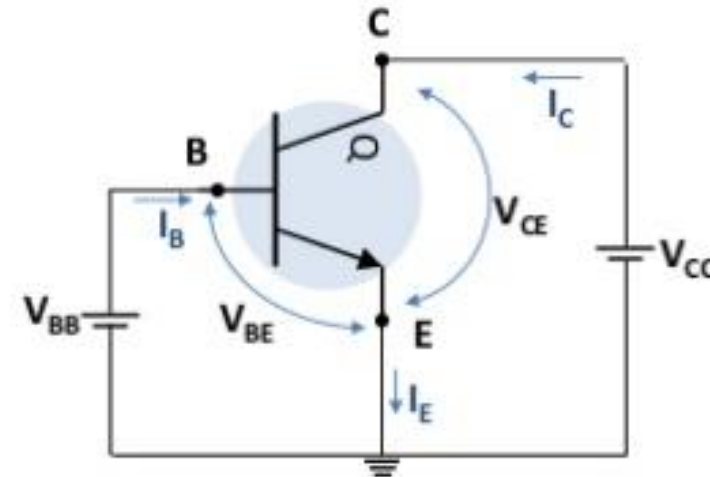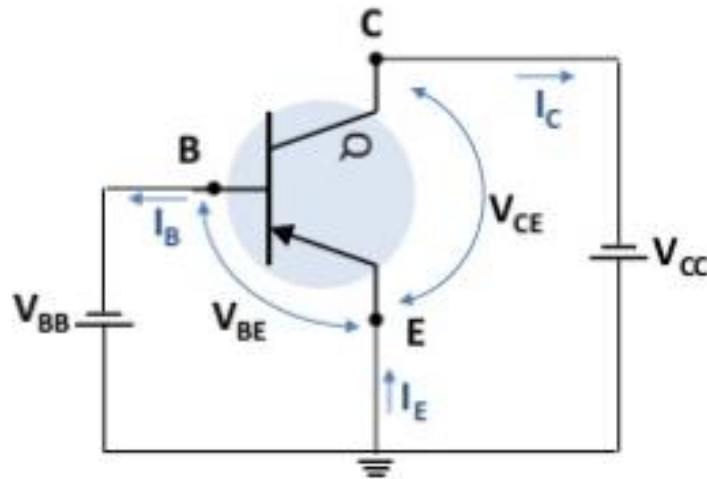Input characteristics of CB configuration

Output characteristics of CB configuration
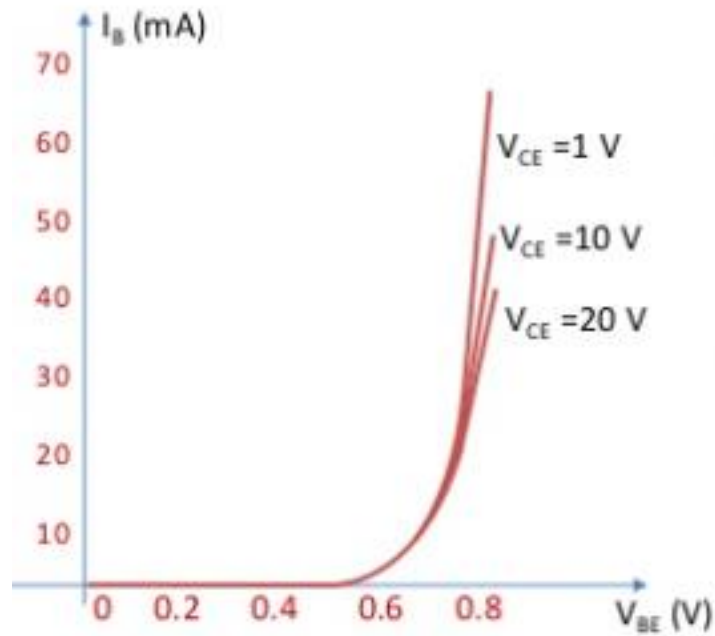
BJT: Common Emitter Configuration

Common emitter configuration pnp transistor   Common emitter configuration npn transistor

- The input set for the CE amplifier relates an input current (I_B) to an input voltage (V_{BE}) for various levels of output voltage (V_{CE}).

- The output set for the CE amplifier relates an output current (I_C) to an output voltage (V_{CE}) for various levels of input current (I_B).
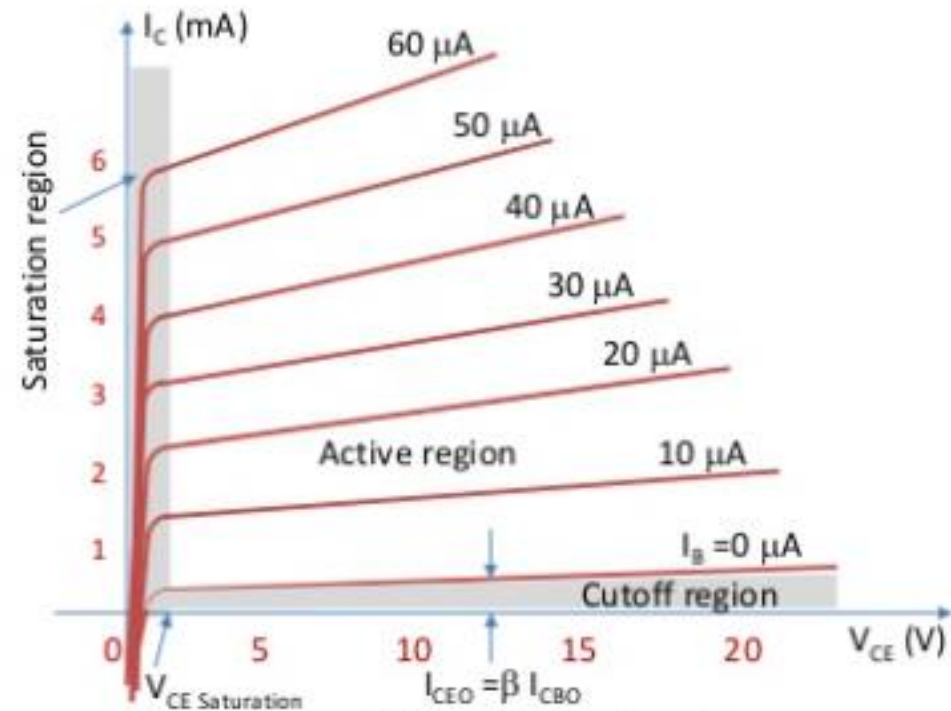
BJT: Common Emitter Configuration

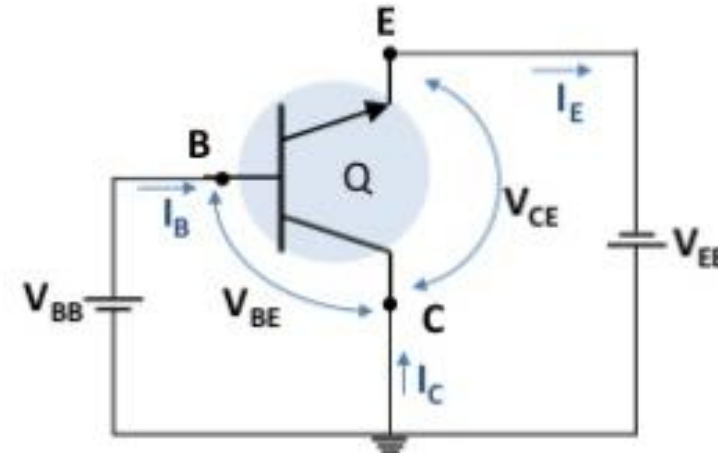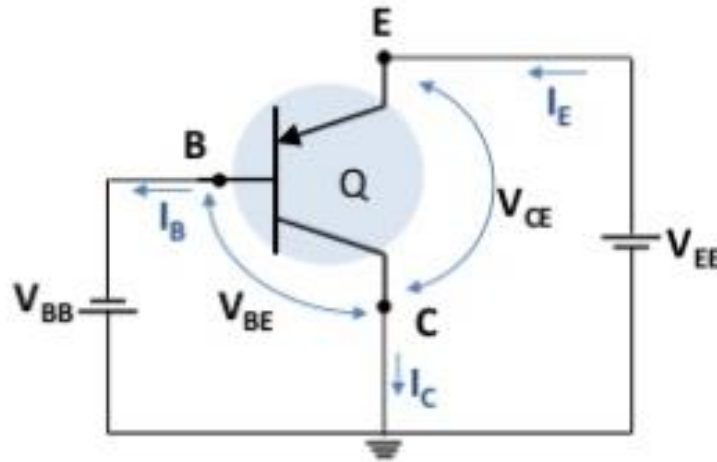Input characteristics of CE configuration

Output characteristics of CE configuration

BJT: Common Collector Configuration


Common emitter configuration pnp transistor   Common emitter configuration npn transistor

- CC configuration is also known as emitter follower configuration as the emitter voltage follows the base voltage.
- This configuration is mostly used as a buffer.
- CC configuration is used mainly for impedance-matching, as it has high-input & low-output impedance, opposite to CB/CE Configuration

BJT: Common collector Configuration

Input characteristics of CC configuration

Output characteristics of CC configuration
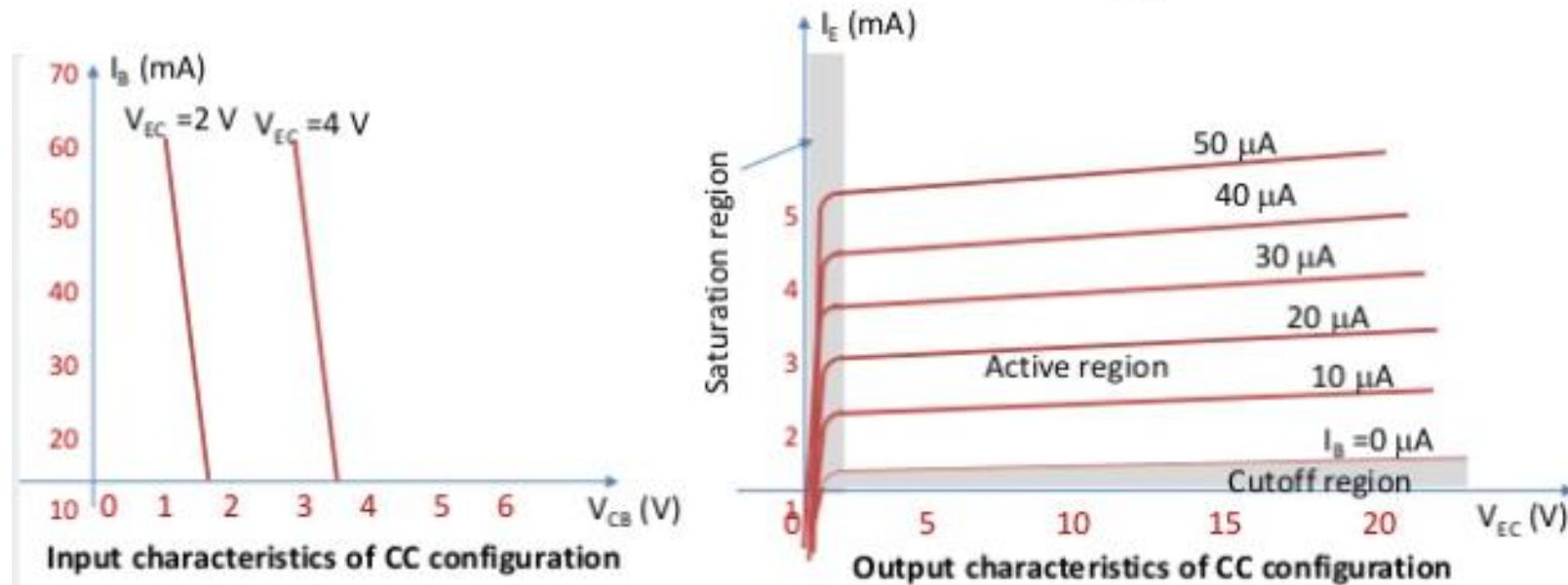
- Input characteristics of the CC configuration is different as current I_B decreases with increase in base collector voltage
- Output characteristics of the CC configuration are the same as of CE configuration.
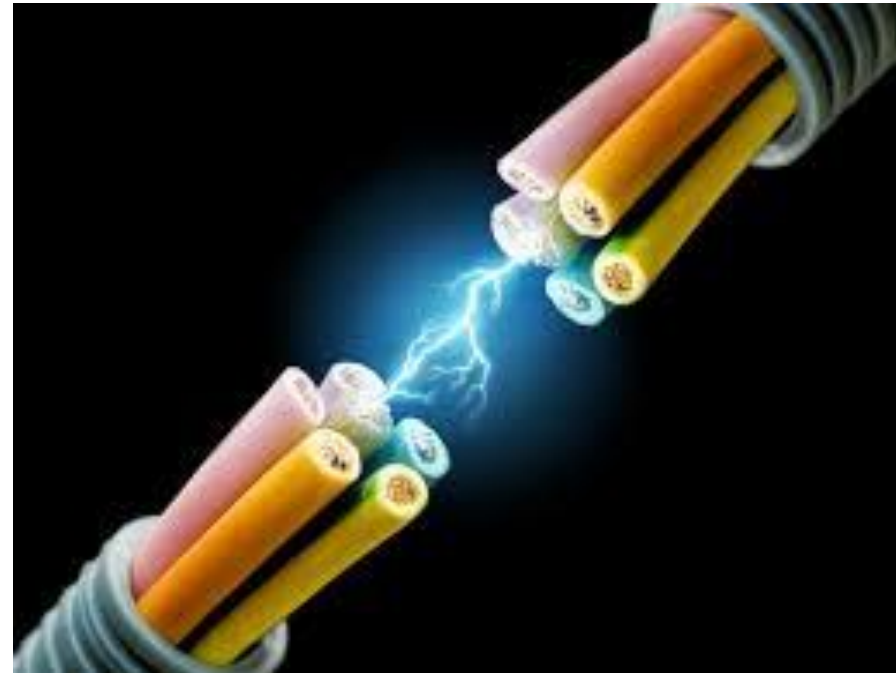
Applications

1) These are the transistors that are preferred in the logic circuits.

2) It is used in the circuits of amplification.

3) These are preferred in the oscillation circuits.

4) These are preferred in the multi-vibrator circuits.

5) In the clipping circuits, these are preferred for wave shaping circuits.

6) It used in the circuits of the timer and the circuits of the time delay.

7) These are used in the circuits of switching.

8) Used in the circuits of detector or as demodulation.

RECAP….

…THANK YOU