



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC
with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna
University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT201 – ELECTRICAL ENGINEERING & INSTRUMENTATION

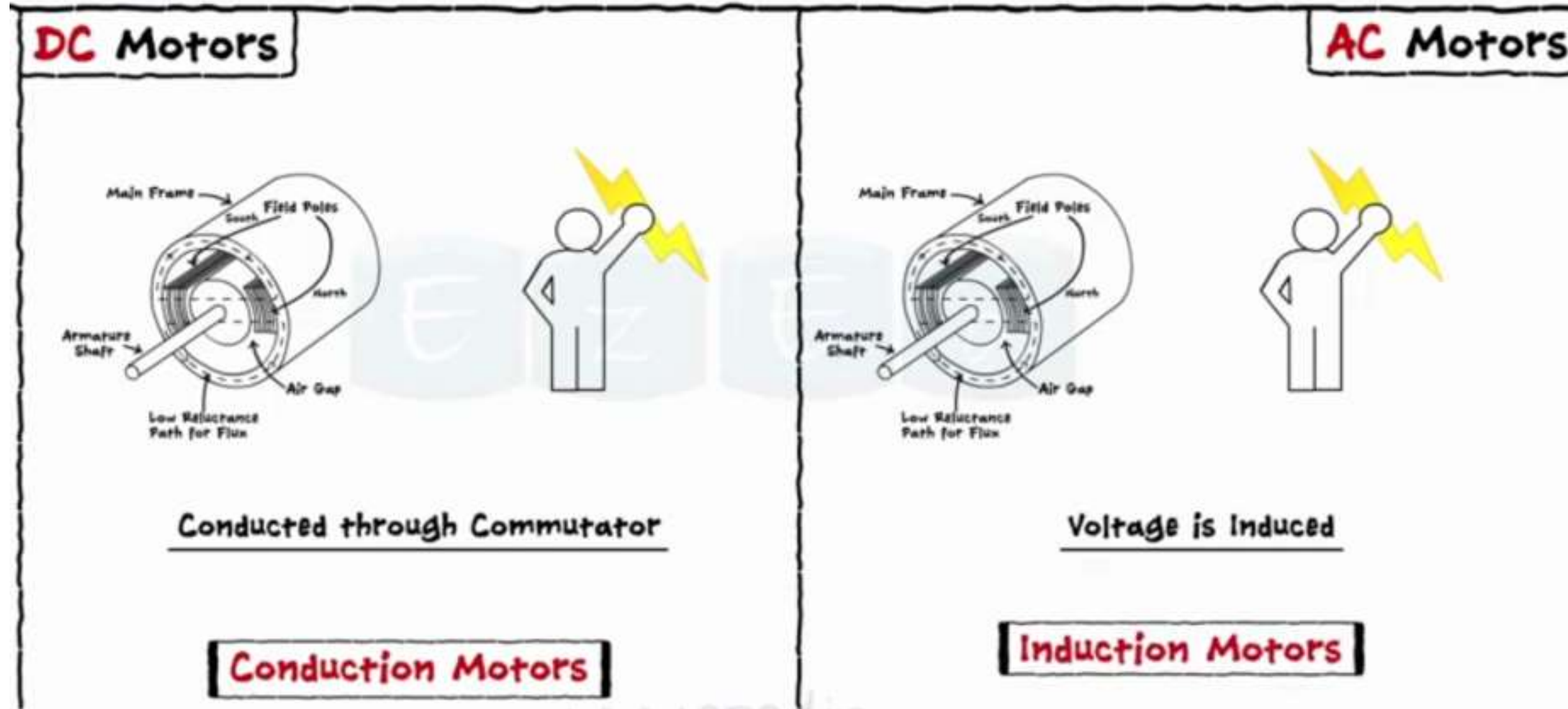
II YEAR/ III SEMESTER

UNIT 3 – INDUCTION MACHINES

TOPIC 1 – SINGLE PHASE INDUCTION MOTOR



SINGLE PHASE INDUCTION MOTOR





OVERVIEW

- **Three Phase Induction Motor :**

- i) Construction : 1) Stators 2) Rotors

- ii) Working Principle

- **Single Phase Induction Motor :**

- i) Construction

- ii) Working

- iii) Types of Induction Motors :

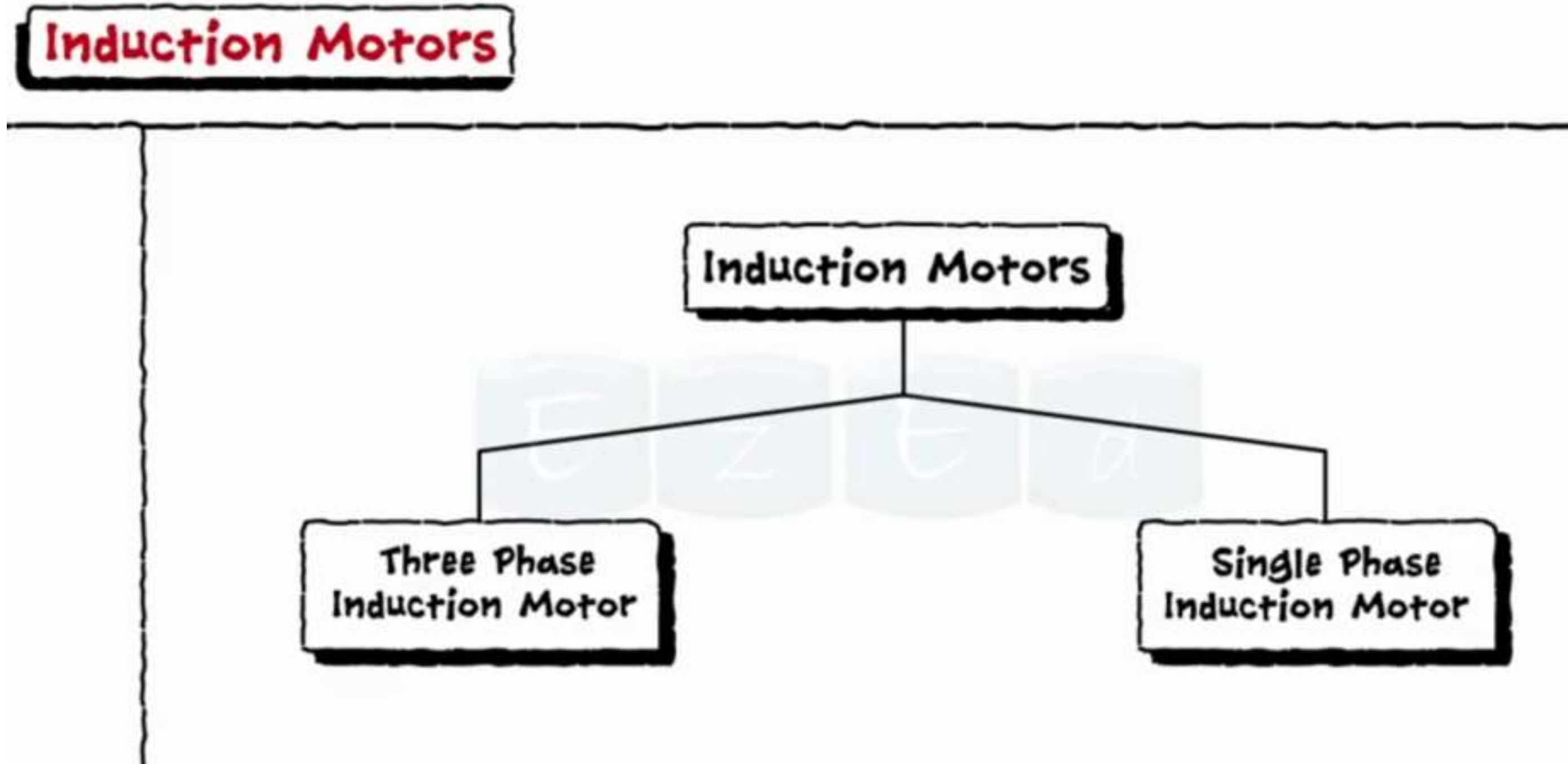
- 1) Split Phase Induction Motor

- 2) Capacitor - Start Induction Motor

- 3) Shaded - Pole Induction Motor

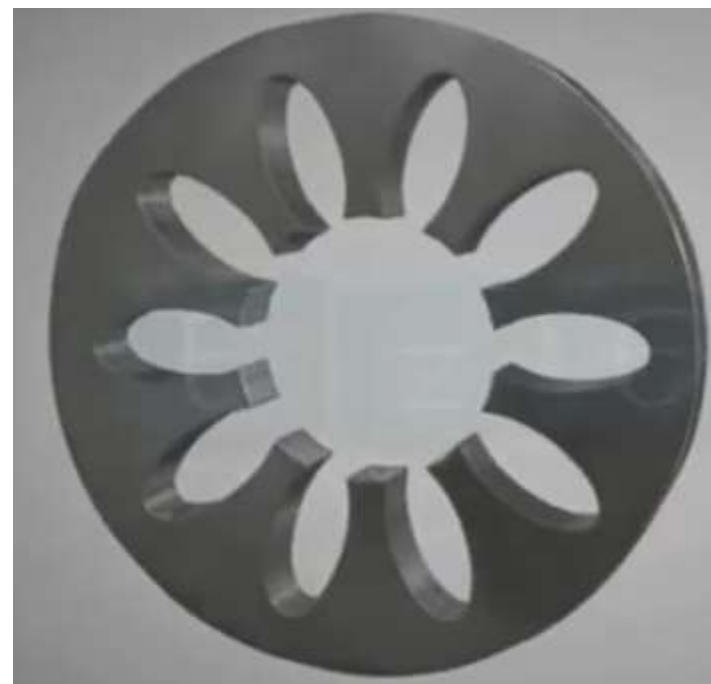
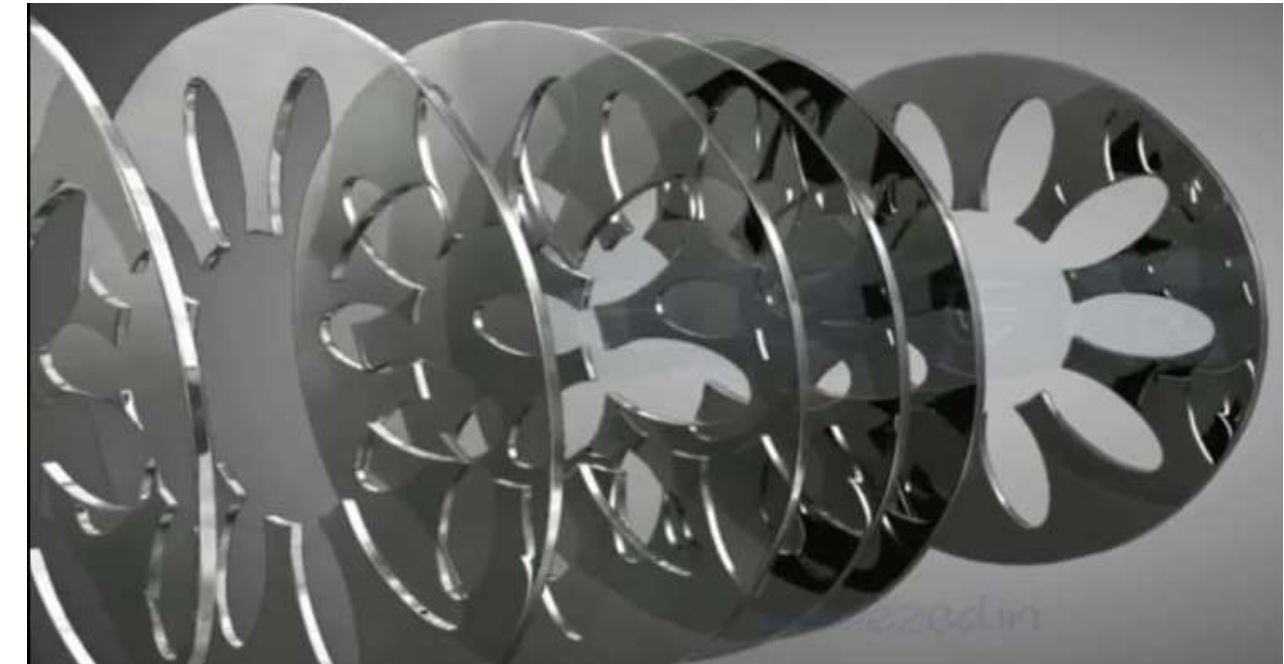


INDUCTION MOTOR





3 PHASE INDUCTION MOTOR-CONSTRUCTION



- STATOR
- ROTOR



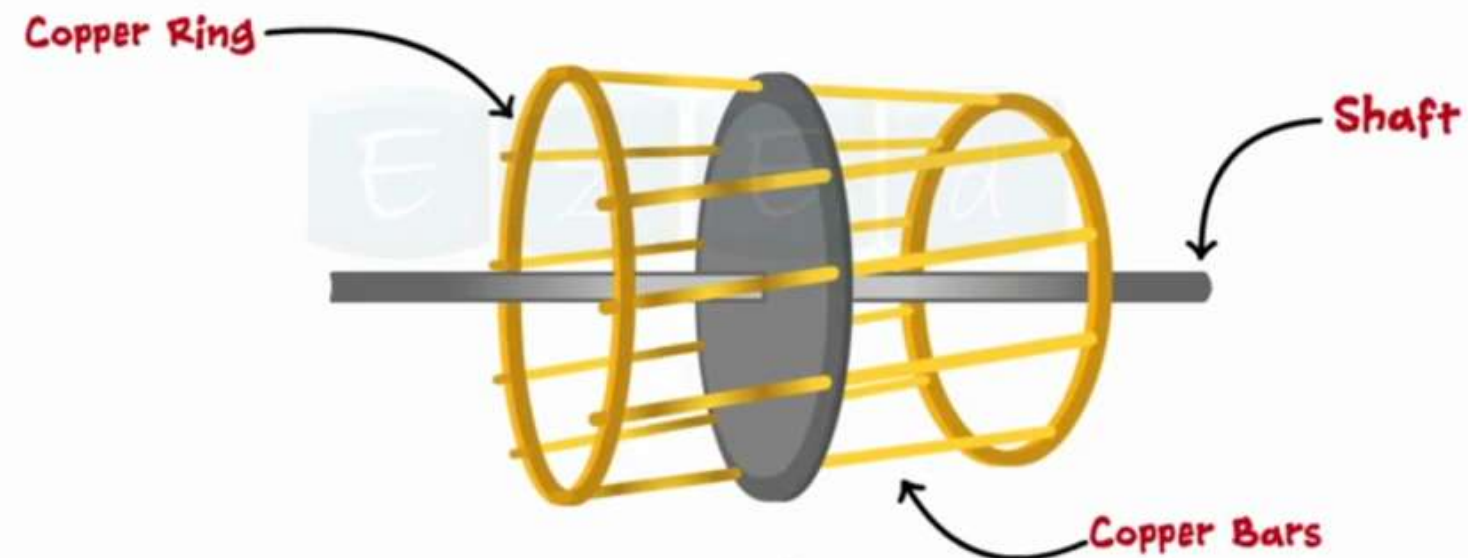
3 PHASE INDUCTION MOTOR-CONSTRUCTION

ROTOR

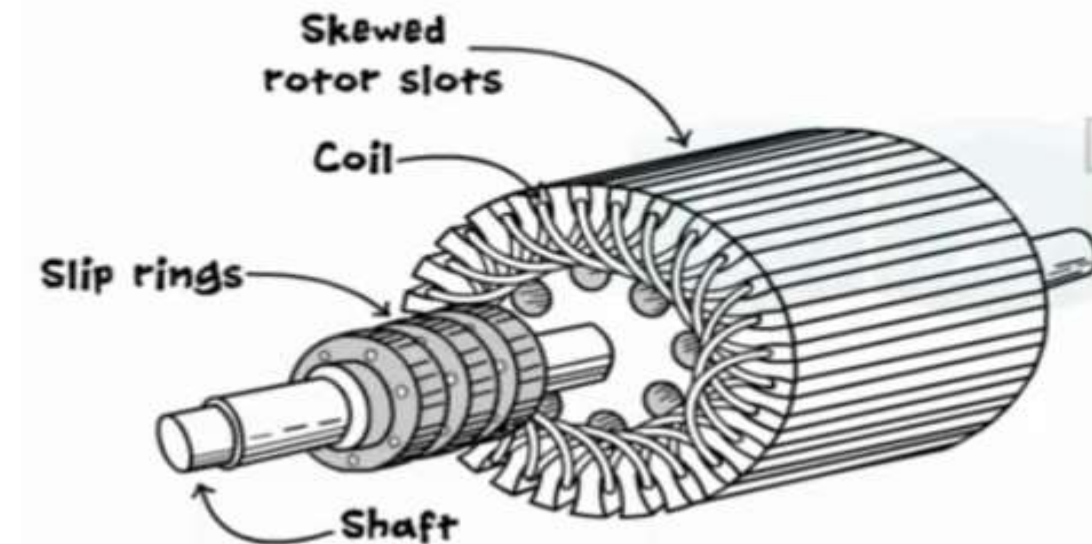
Three Phase Induction Motor

Squirrel Cage Rotor

• Looks like the cage of a Squirrel ,

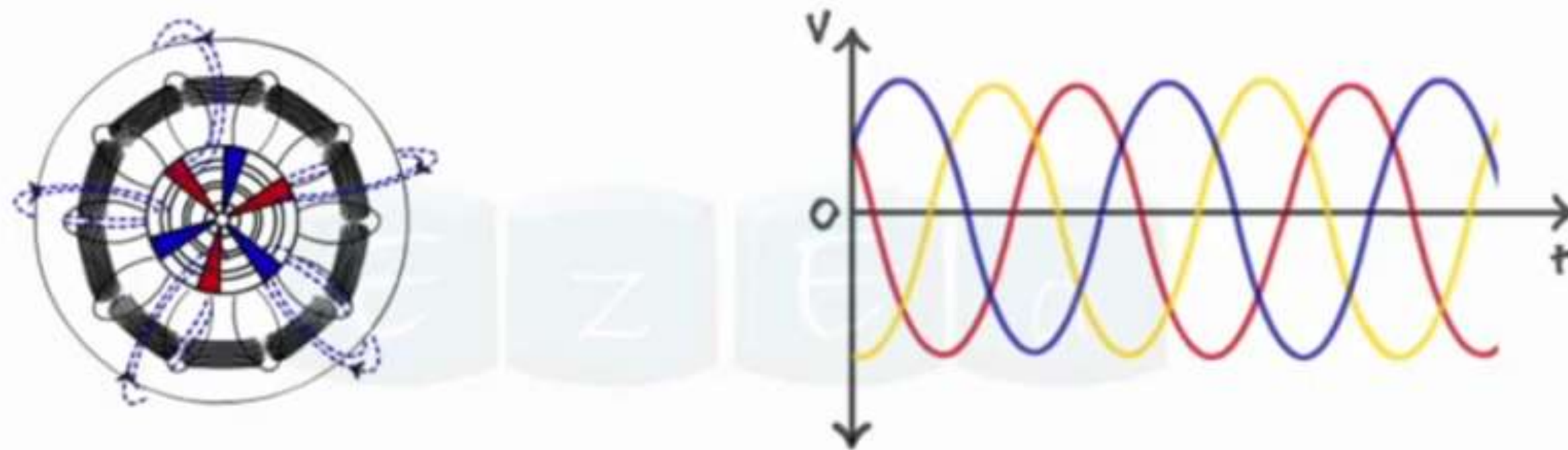


Phase Wound Rotor





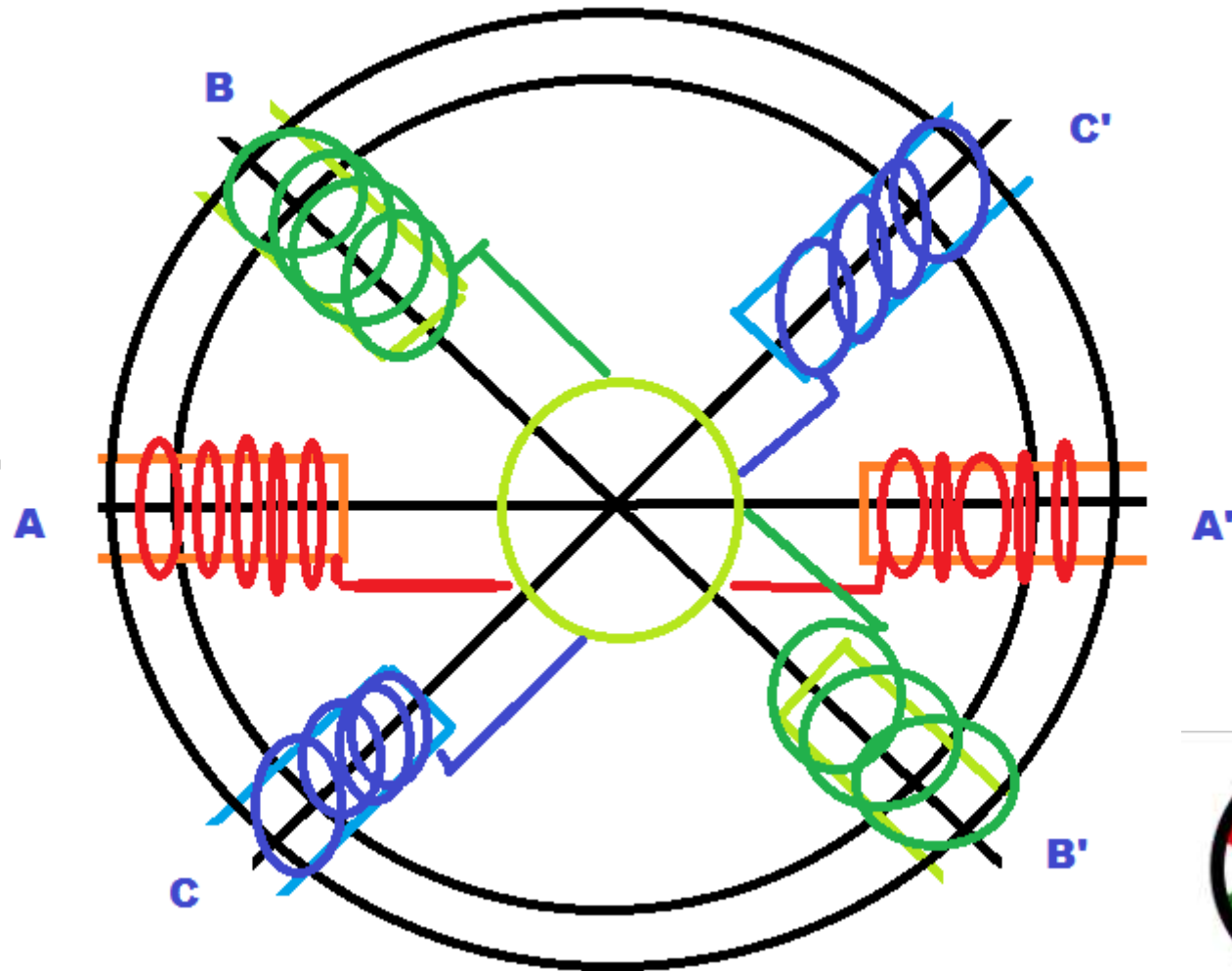
3 PHASE INDUCTION MOTOR-WORKING



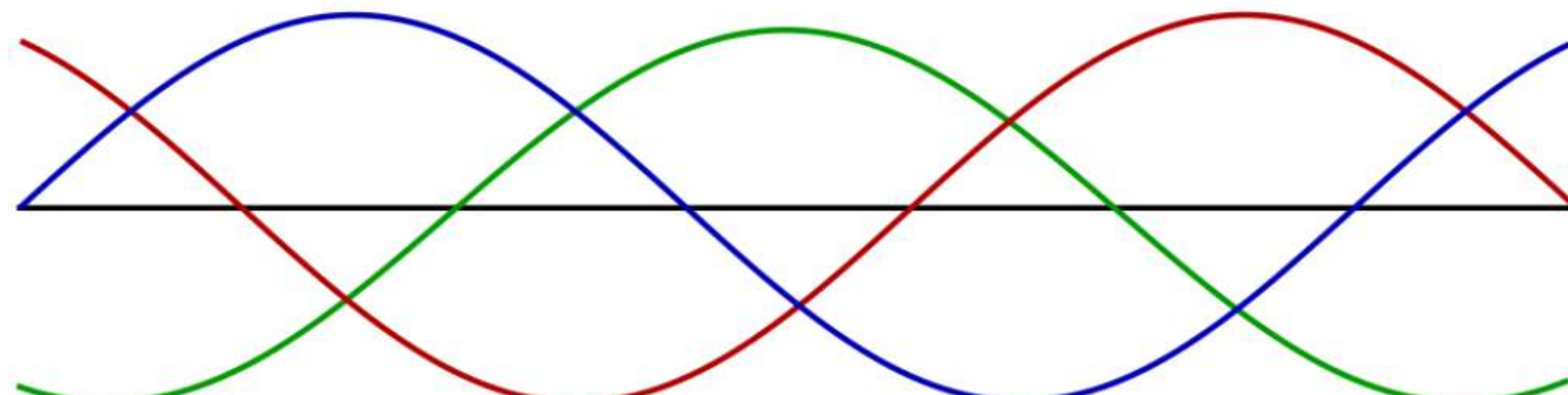
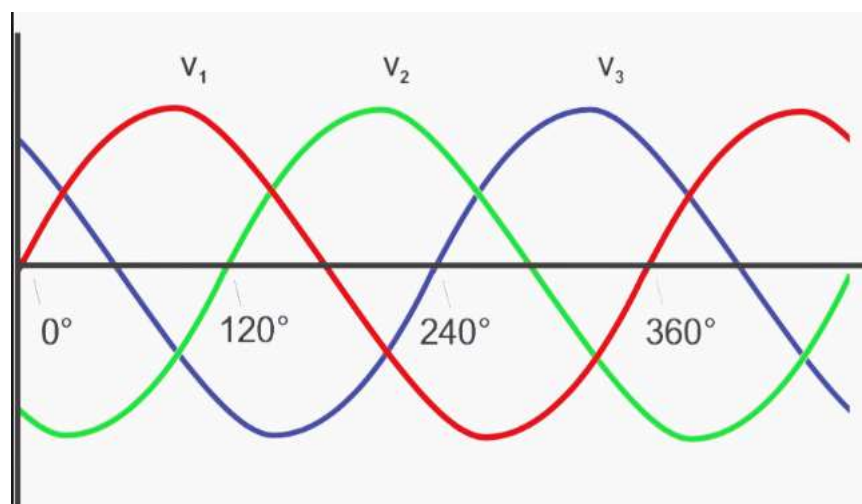
Faradays Law : when the copper bars of a rotor cut this magnetic field, the current gets induced in the rotor



THREE PHASE INDUCTION MOTOR



- Three-phase AC induction motor is a rotating electric machine that is designed to operate on a three-phase supply.
- This 3 phase motor is also called as an asynchronous motor.



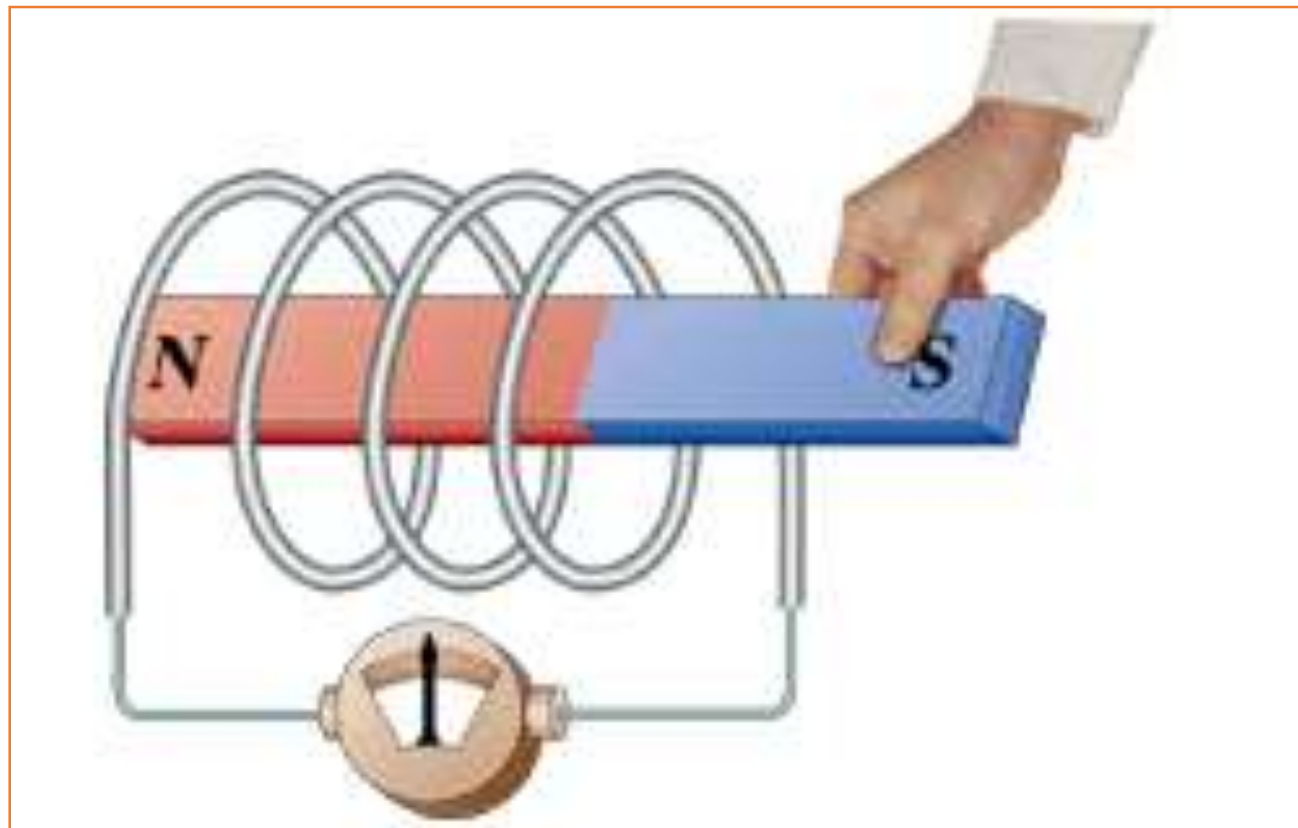


PRINCIPLE OF OPERATION



FIRST LAW:

Any Change in the magnetic field of a coil of wire will cause an EMF to be induced in the coil. This EMF induced is called induced EMF and if conductor circuit is closed, the current will also circulate through the circuit and this current is called induced current



$$\text{Emf} = -N \frac{\Delta\Phi}{\Delta t}$$

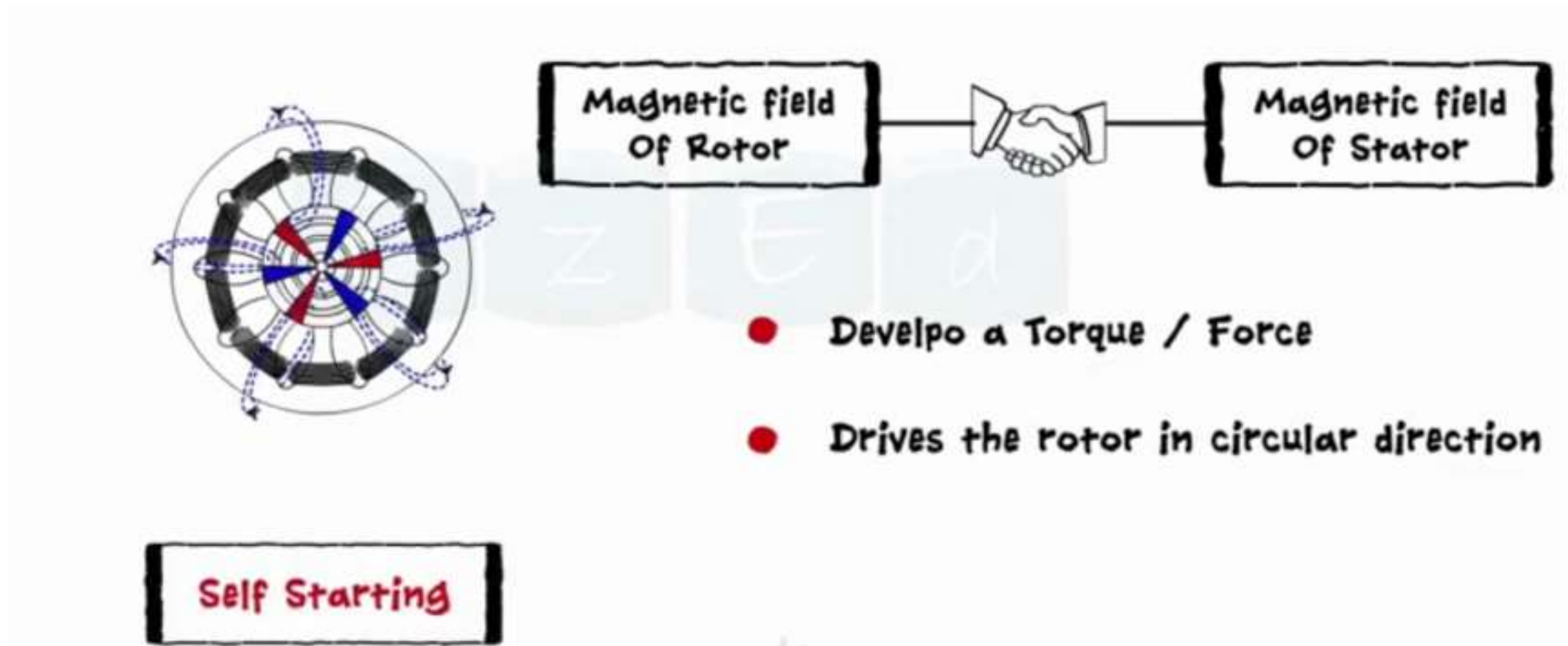
Lenz's Law

SECOND LAW:

It states that the Magnitude of emf induced in the coil is equal to the rate of change of flux that linkages with the coil. The flux linkage of the coil is the product of no of turns in the coil and flux associated with the coil

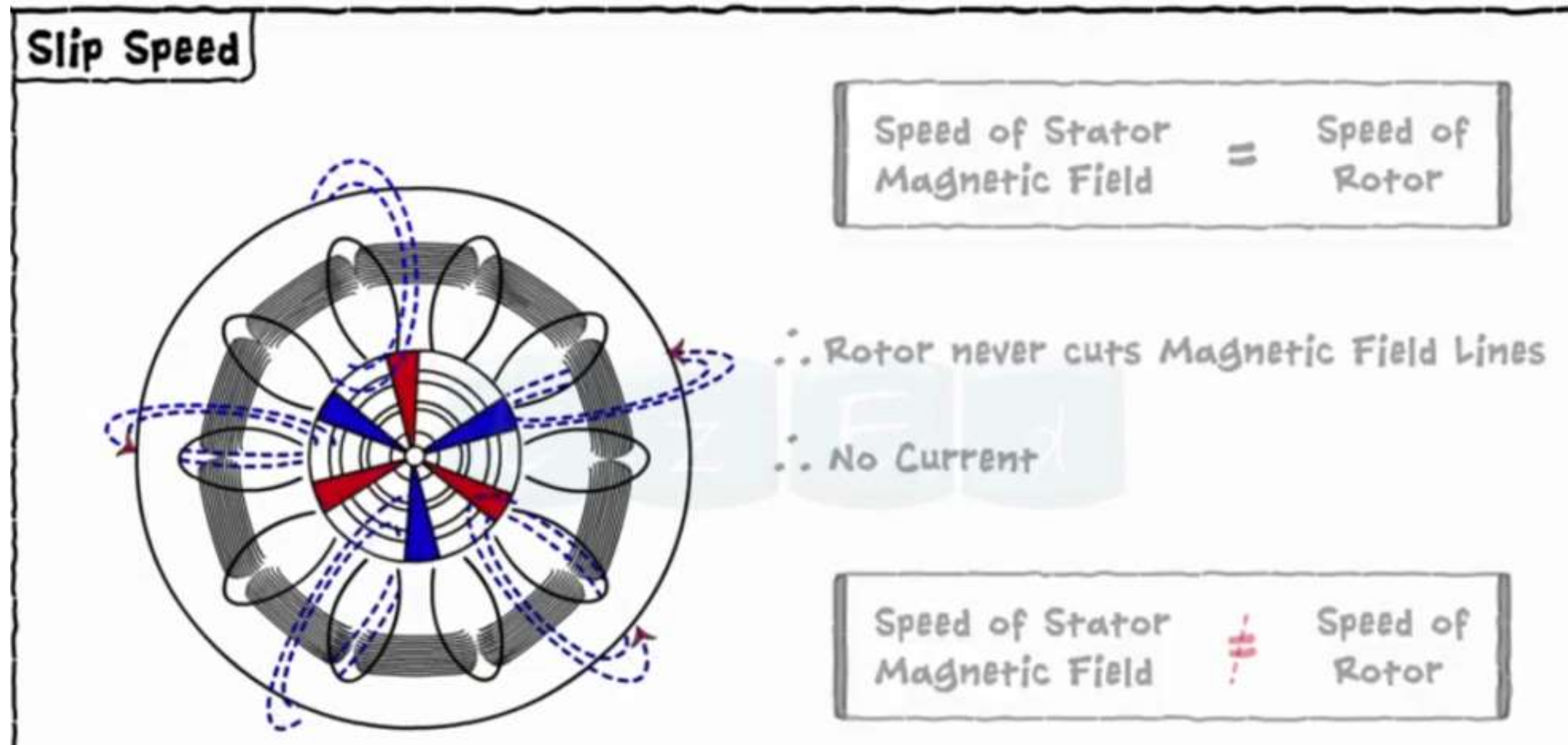


3 PHASE INDUCTION MOTOR-WORKING





INDUCTION MOTOR

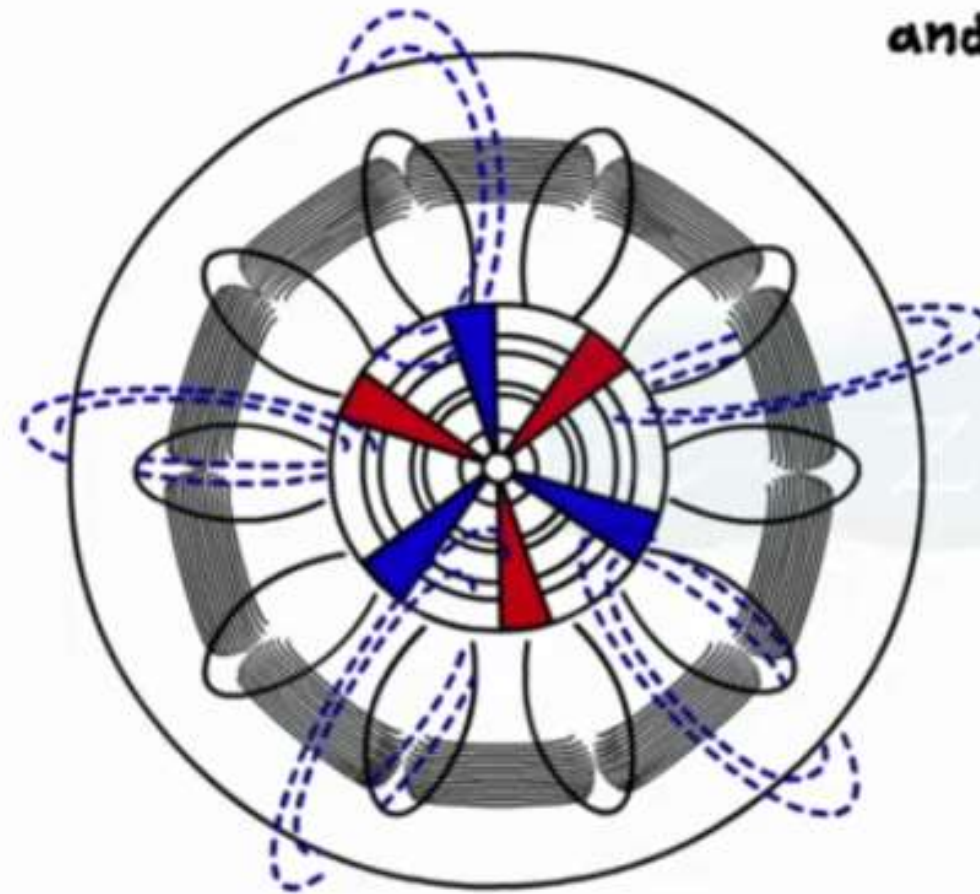




INDUCTION MOTOR

Slip Speed

The difference between the synchronous speed and the actual speed is called as the **Slip Speed**



$$\text{Slip Speed} = (N_s - N) \text{ rpm}$$

$$\% \text{ Slip} = S = \frac{N_s - N}{N_s} * 100$$

Where

N_s = Synchronous speed in rpm

N = Actual rotor speed in rpm

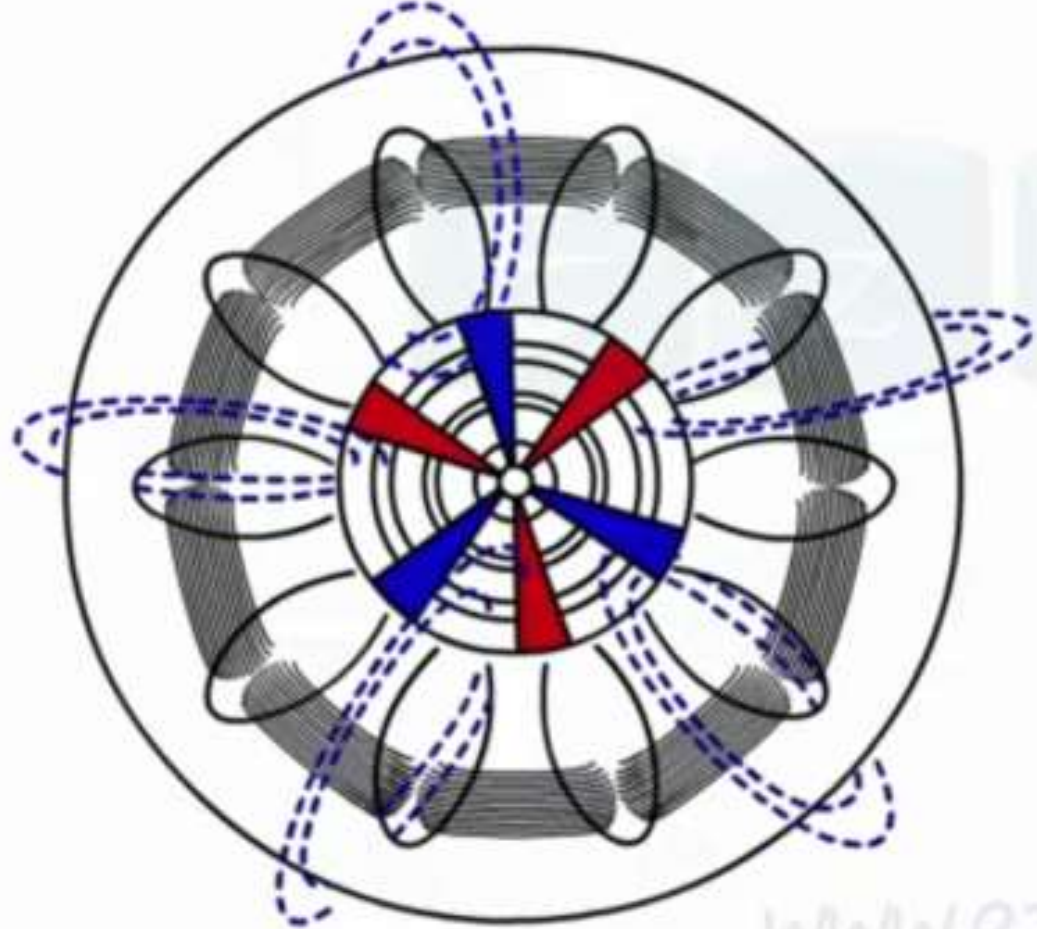




INDUCTION MOTOR

Induction Motors

Slip Speed

The Advantages Of Three Phase Motors



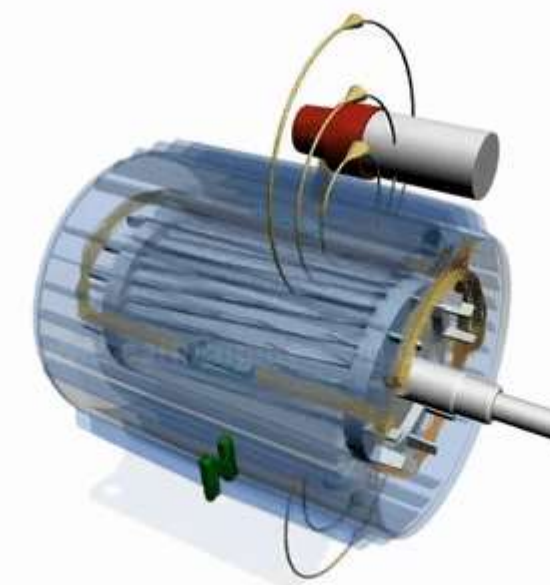
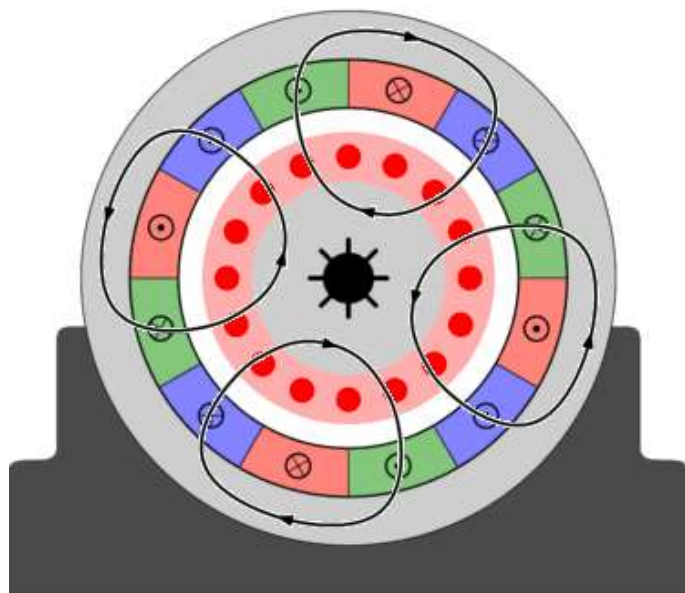
- 1) Cheap 
- 2) Robust 
- 3) Reliable
- 4) Can withstand overload condition:



SINGLE PHASE INDUCTION MOTOR

In our society mostly single- ϕ techniques are used instead of 3 phases.

- The single- ϕ system is less expensive than the 3-phase system, and our home appliances are also designed to work on the single-phase system which also enhances its importance.
- The single- ϕ induction motor is easy to design, less costly, dependable, and can be easily repaired.
- As it has many benefits, so it's used in fans, washing machines, juicer machines, and some other types of machinery.





SINGLE PHASE INDUCTION MOTOR





SINGLE PHASE INDUCTION MOTOR

➤ The single-phase motors are more preferred over a three-phase induction motor for domestic, commercial applications. Because from utility, only single-phase supply is available. So, in this type of application, the three-phase induction motor cannot be used.



Rotor



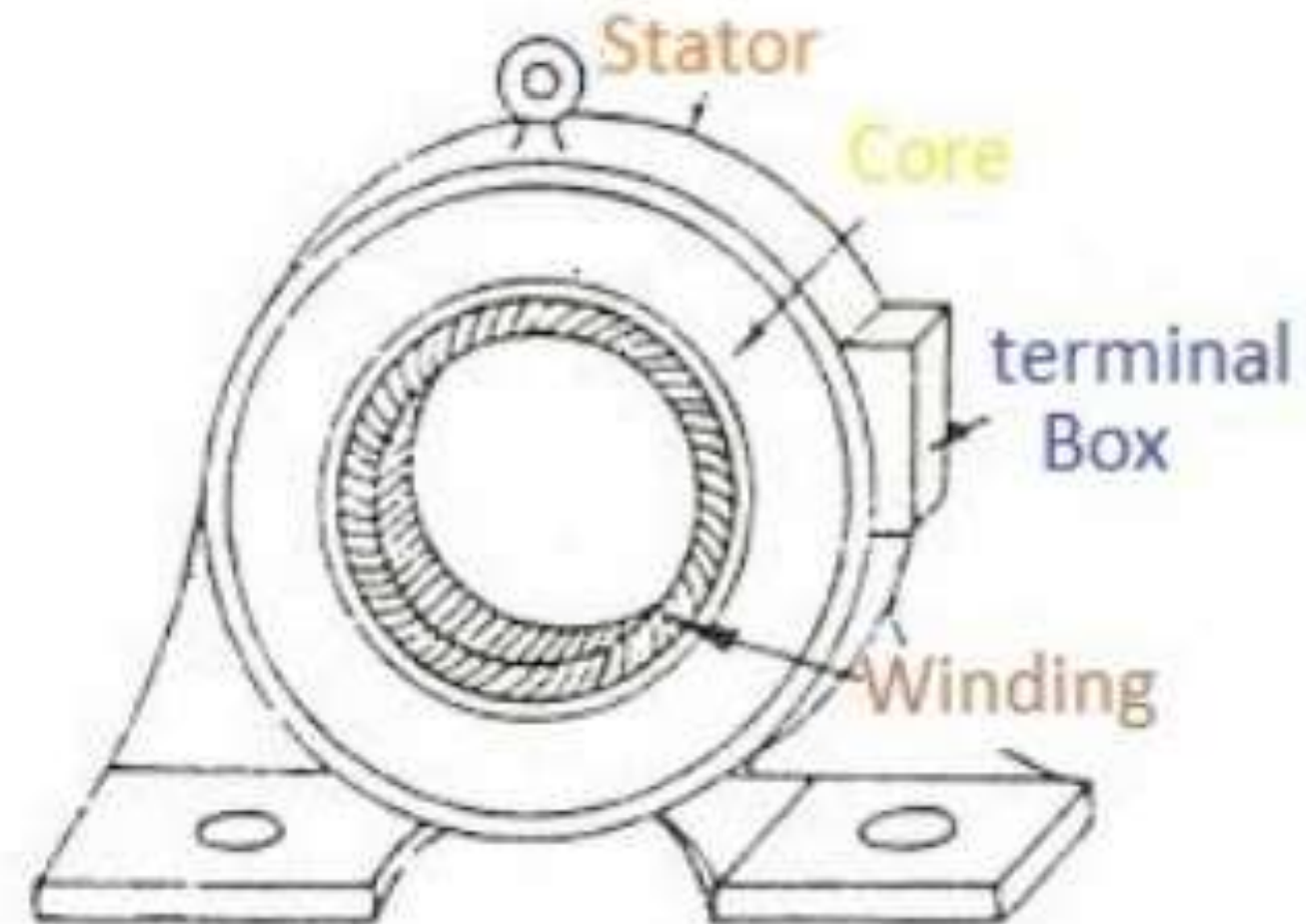
Stator





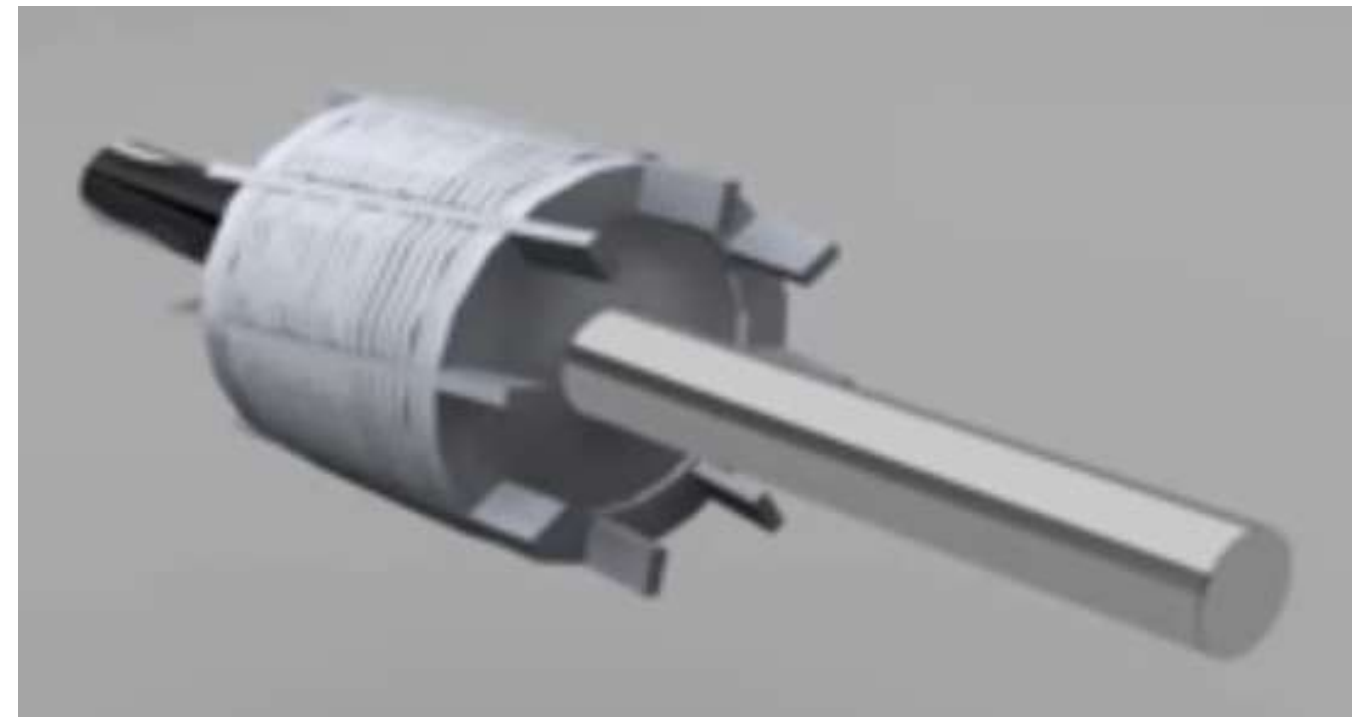
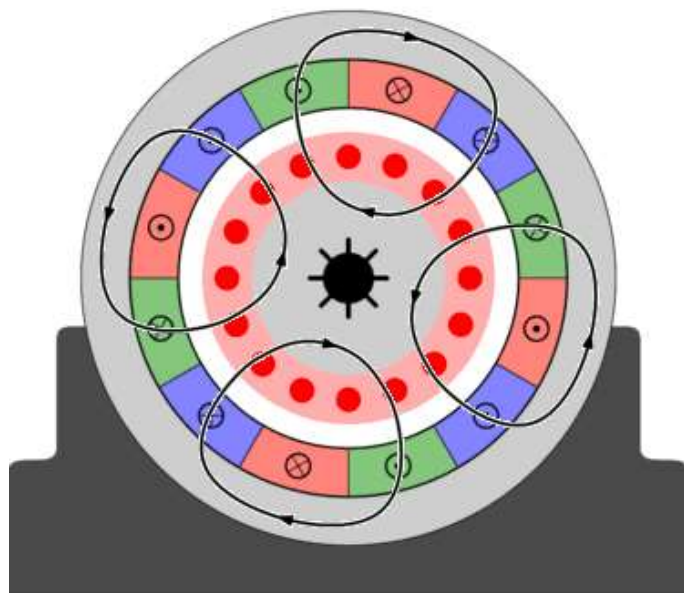
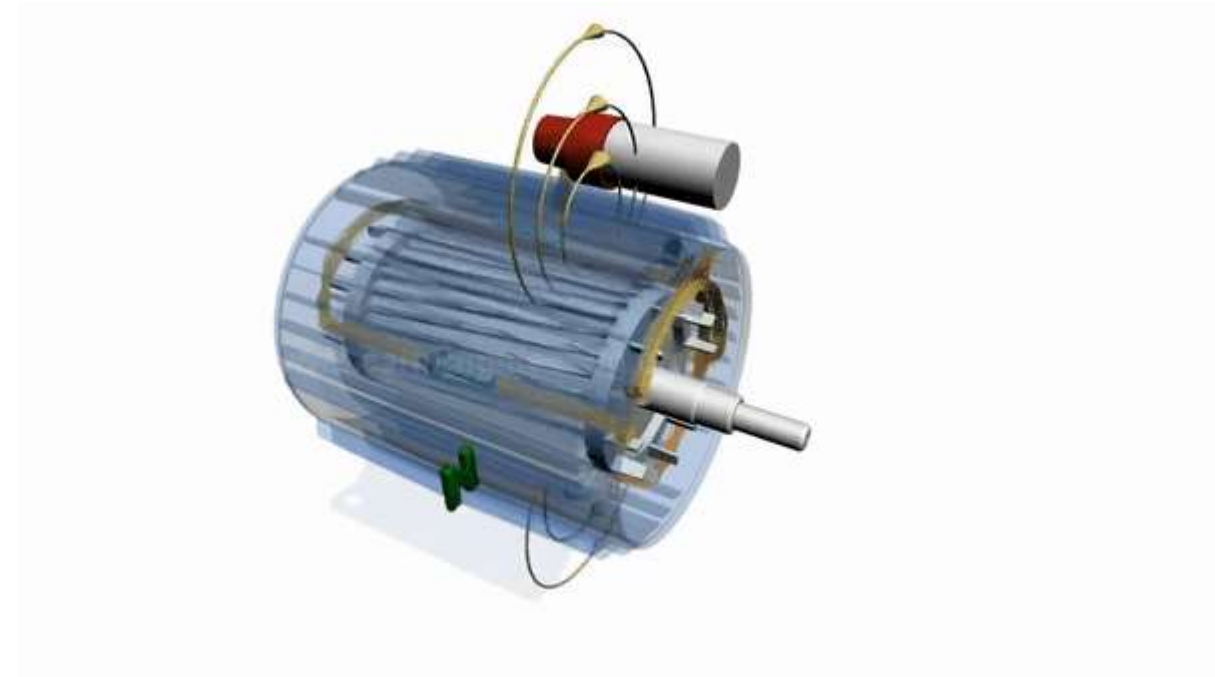
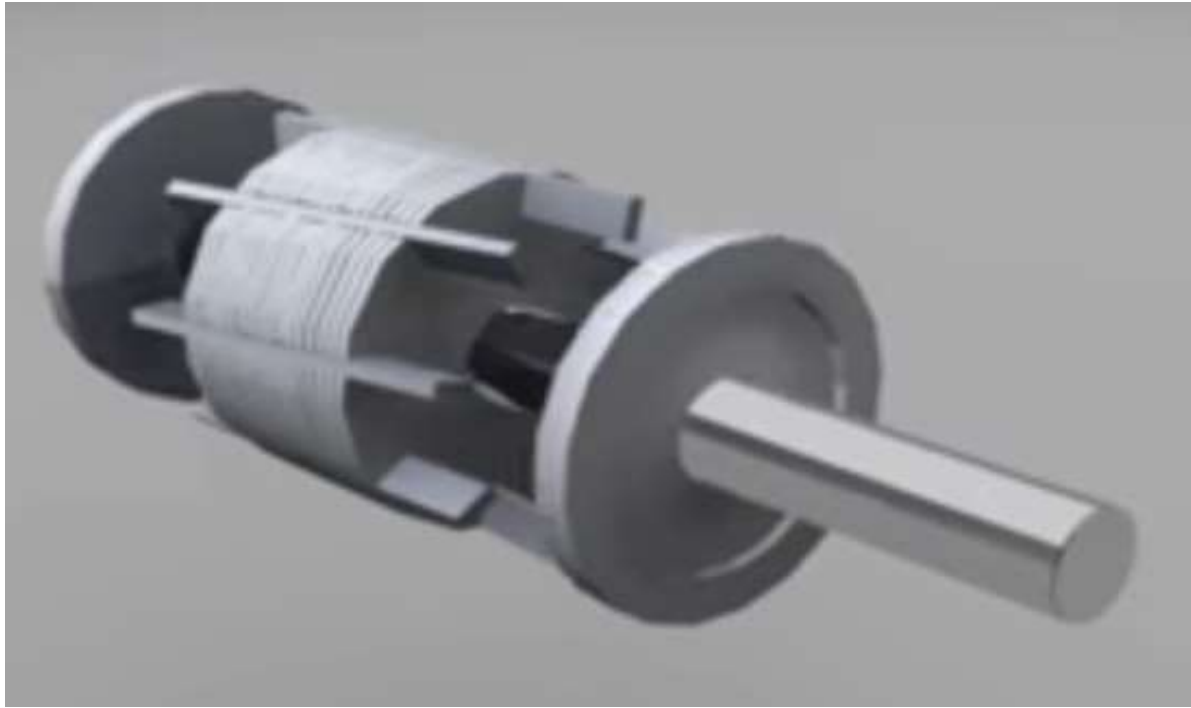
SINGLE PHASE INDUCTION MOTOR

Stator of Induction Motor





SINGLE PHASE INDUCTION MOTOR





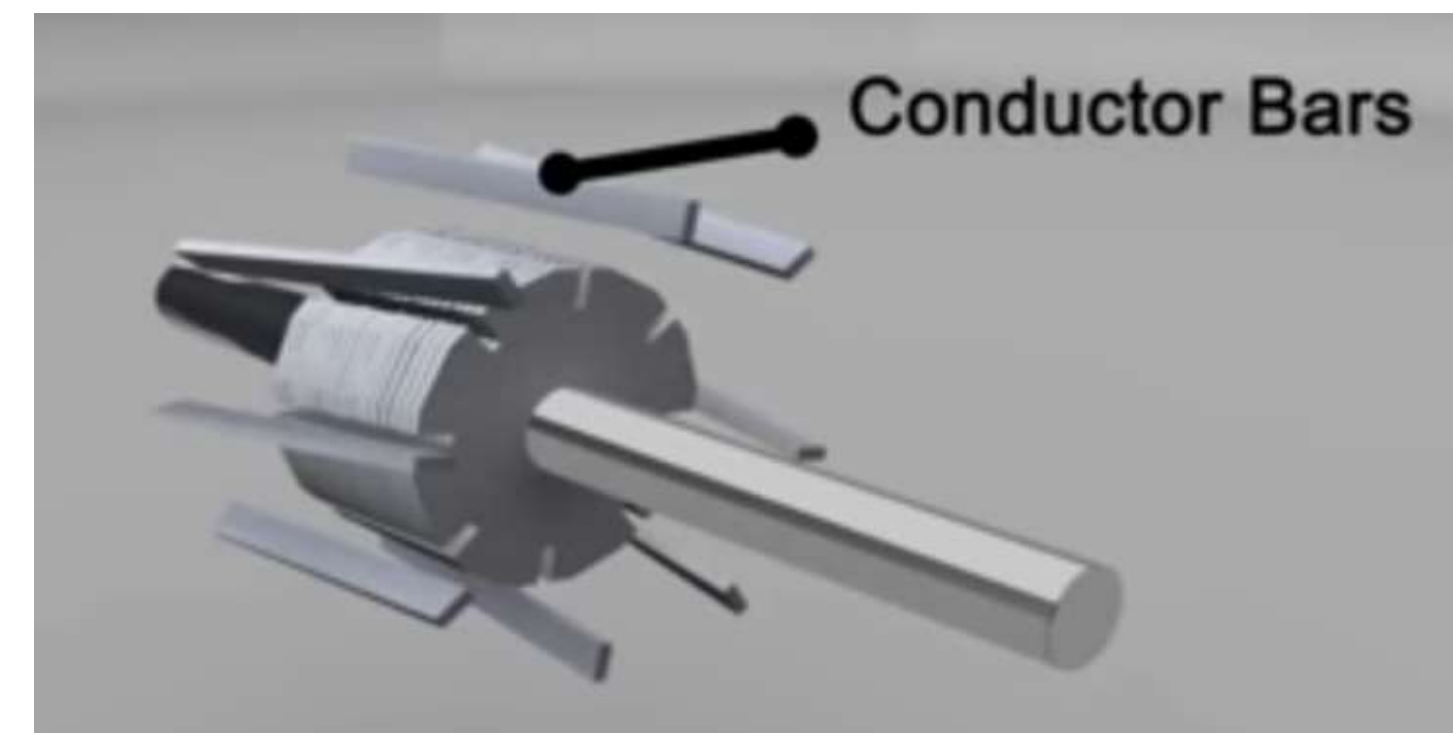
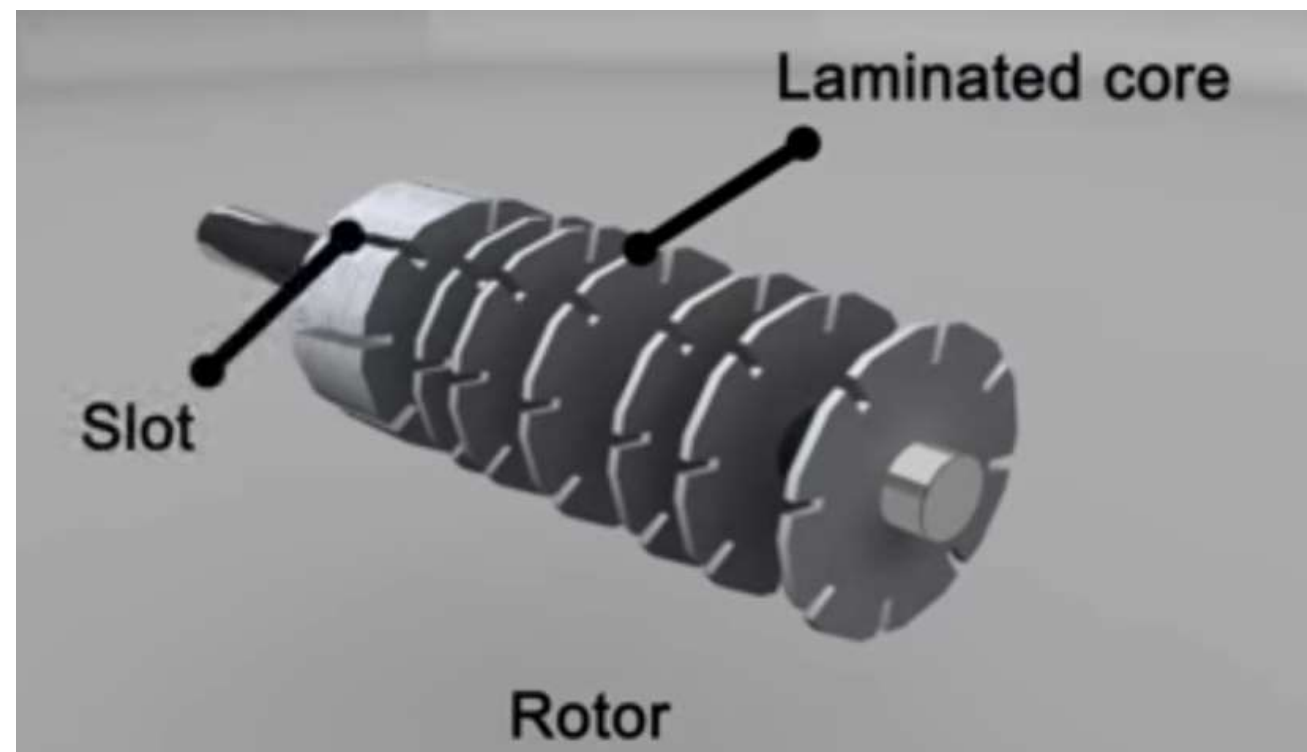
SINGLE PHASE INDUCTION MOTOR

In a single-phase induction motor, there are two winding are used in stator except in shaded-pole induction motor.

- One winding is the main winding (The single-phase supply is given to the stator winding (main winding))
- Second is auxiliary winding

ROTOR:

Instead of rotor winding, rotor bars are used and it is short-circuited at the end by end-rings.





*Thank
You*