



# **SNS COLLEGE OF TECHNOLOGY**

(An Autonomous Institution)

**COIMBATORE-35**

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

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



## **19EET101 / BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**

**I YEAR / I SEMESTER**

### **UNIT-I: ELECTRICAL CIRCUITS AND MEASUREMENTS**

## **MOVING COIL, MOVING IRON INSTRUMENTS**



# TOPIC OUTLINE



- Types
  - Moving Coil instruments
  - Moving Iron instruments
  - Connections of Ammeter and Voltmeter
  - Evaluation



# INSTRUMENTS FOR V & I



## Types of instruments for Voltmeter and Ammeter:

1. Permanent magnet Moving Coil (MC) type
2. Moving Iron (MI) type
3. Hot wire type
4. Induction type



# MOVING COIL INSTRUMENTS

## Working Principle:

- When a current carrying conductor is placed in a magnetic field, it experiences a force. It is given by expression,

$$F = BIL$$

Where F = Force in Newton,

B = Flux density is tesla,

I = Current is ampere,

L = Length of conductor in meter.

- The current I which is to be measured is passed through the moving coil and experiences a force which is directly proportional to this current.
- The pointer attached to moving coil also move.
- The angle through which the pointer moves is proportional to current I.



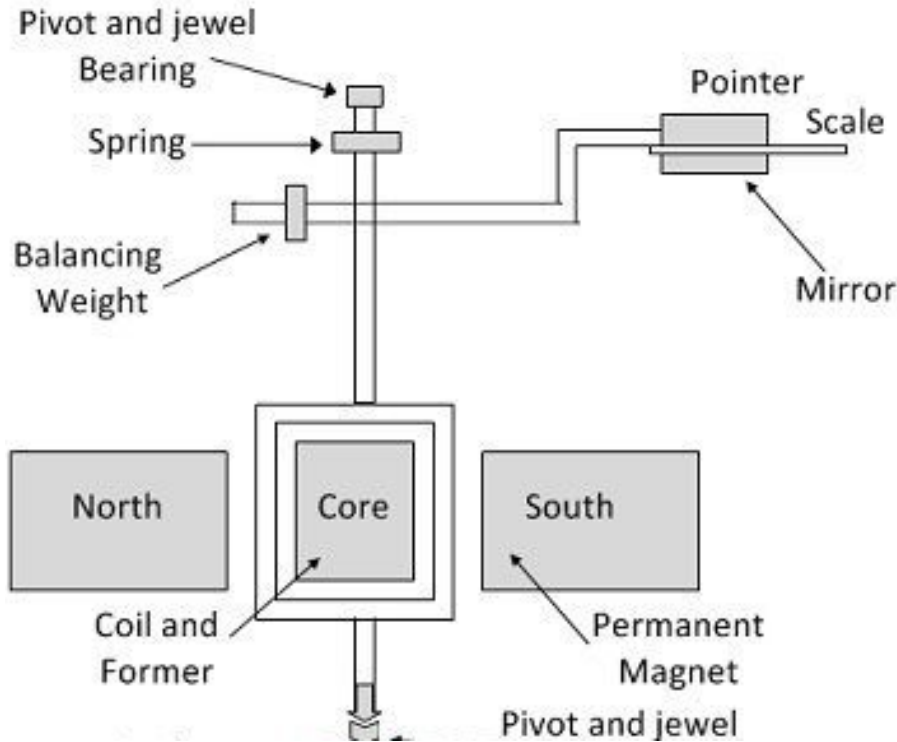
# MOVING COIL INSTRUMENTS

## Construction:

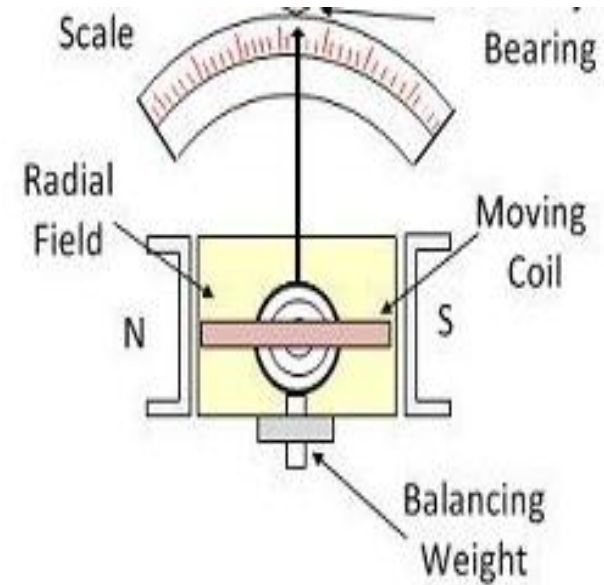
- A coil of thin wire is mounted on an aluminum frame (spindle) positioned between the poles of a U shaped permanent magnet which is made up of magnetic alloys like alnico.
- The coil is pivoted on the jewelled bearing and thus the coil is free to rotate.
- The current is fed to the coil through spiral springs which are two in numbers.
- The coil which carries a current, which is to be measured, moves in a strong magnetic field produced by a permanent magnet
- A pointer is attached to the spindle which shows the measured value on the scale



# MOVING COIL INSTRUMENTS



**FRONT VIEW**



**TOP VIEW**



# MOVING COIL INSTRUMENTS

## Advantages of PMMC :

- The PMMC consumes less power and has great accuracy.
- It has uniformly divided scale
- PMMC has a high torque to weight ratio.
- Used as ammeter or voltmeter with suitable resistance.

## Disadvantages of PMMC :

- Can only be used on D.C supply as the reversal of current produces reversal of torque on the coil.
- Costly instrument.



# MOVING IRON INSTRUMENTS

## Types of moving iron instruments:

1. Attraction type
2. Repulsion type

## Principle of Attraction type MI:

- A soft iron piece gets magnetized when it is brought into a magnetic field produced by a permanent magnet.
- The same phenomenon happens when the soft iron piece is brought near either of the ends of a coil carrying current.
- The iron piece is attracted towards that portion where the magnetic flux density is more.





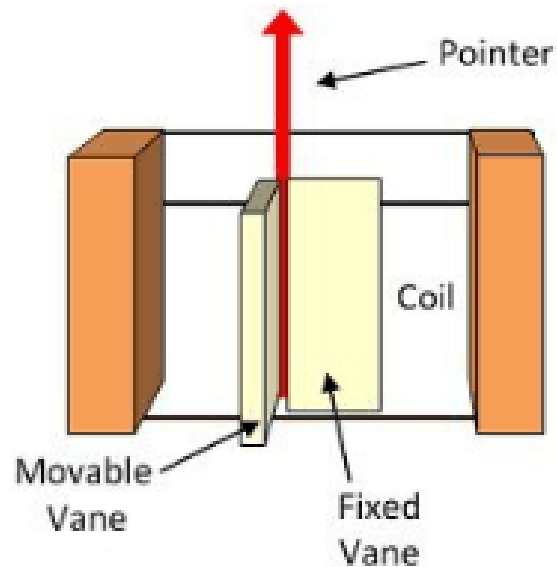
# MOVING IRON INSTRUMENTS

## Construction:

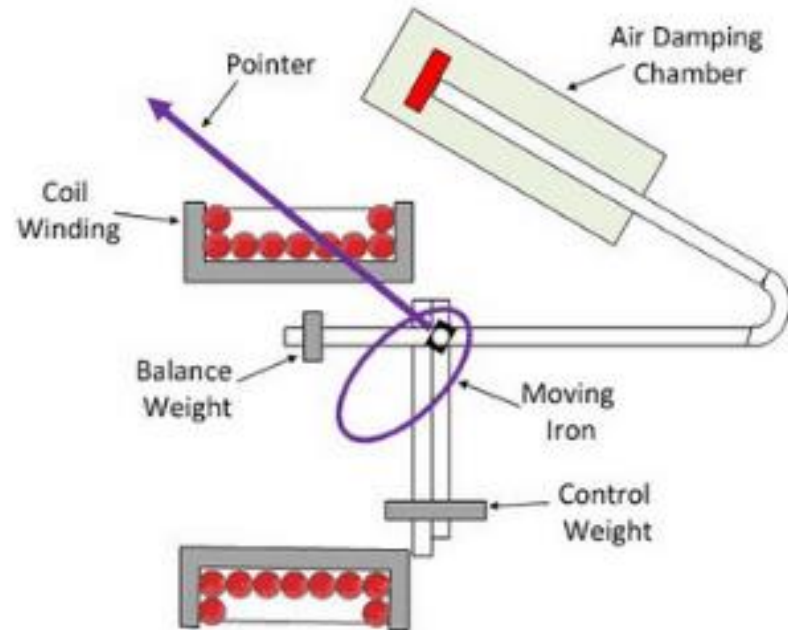
- The moving iron, i.e. the disc of soft iron, is eccentrically mounted.
- Coil is situated around the disc. When the coil is excited it produces magnetic field.
- Due to magnetic field the moving iron moves from the weaker field outside the coil to the stronger field inside the coil.
- Thus moving iron gets attracted inwards and pointer attached to it moves over the scale



# MOVING IRON INSTRUMENTS



**FRONT VIEW**



**TOP VIEW**



# MOVING IRON INSTRUMENTS

## Advantages MI :

- Suitable of AC as well as DC measurements.
- Good accuracy.
- Cheaper in cost as compared to permanent magnet moving coil instruments.
- The instrument has high torque to weight ratio.

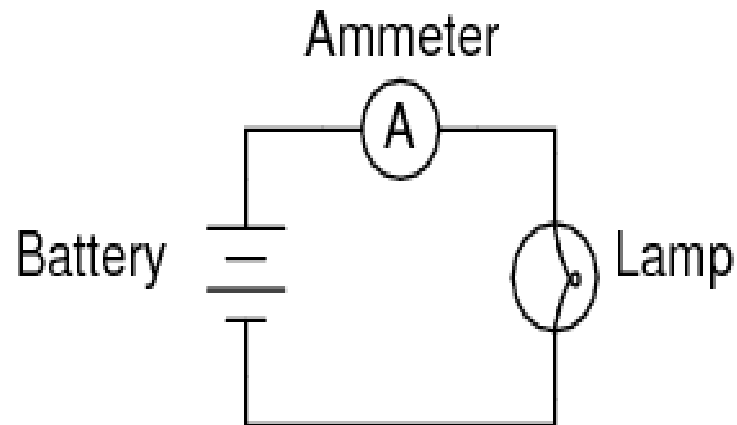
## Disadvantages of MI:

- Power consumed by the instrument is high as compared to that of the permanent magnet moving coil instrument.
- The scale is non-uniform



# CONNECTION DIAGRAMS

- **Connection diagram of an Ammeter:**
  - Ammeter is used for the measurement of current.
  - Ammeter is always connected in series with the load
  - Resistance offered by an ammeter is very small

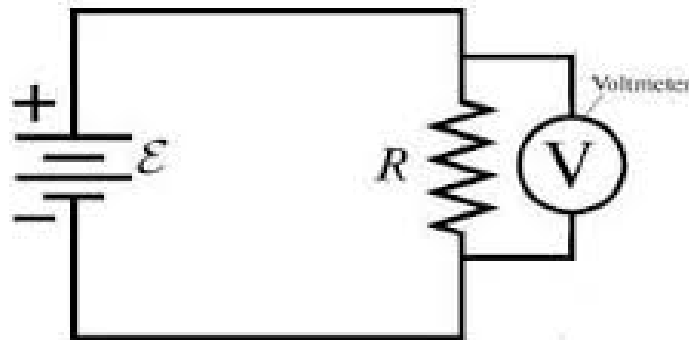




# CONNECTION DIAGRAMS

- **Connection diagram of a voltmeter:**

- A voltmeter is used for the measurement of voltage (potential difference).
- Connected across the points between which the potential difference is to be measured.
- A voltmeter has a high resistance, so it draws very small current.





# RECAP...



# ...THANK YOU