



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

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**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 in tesla,

I = Current in 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 moves.
- The angle through which the pointer moves is proportional to current I.



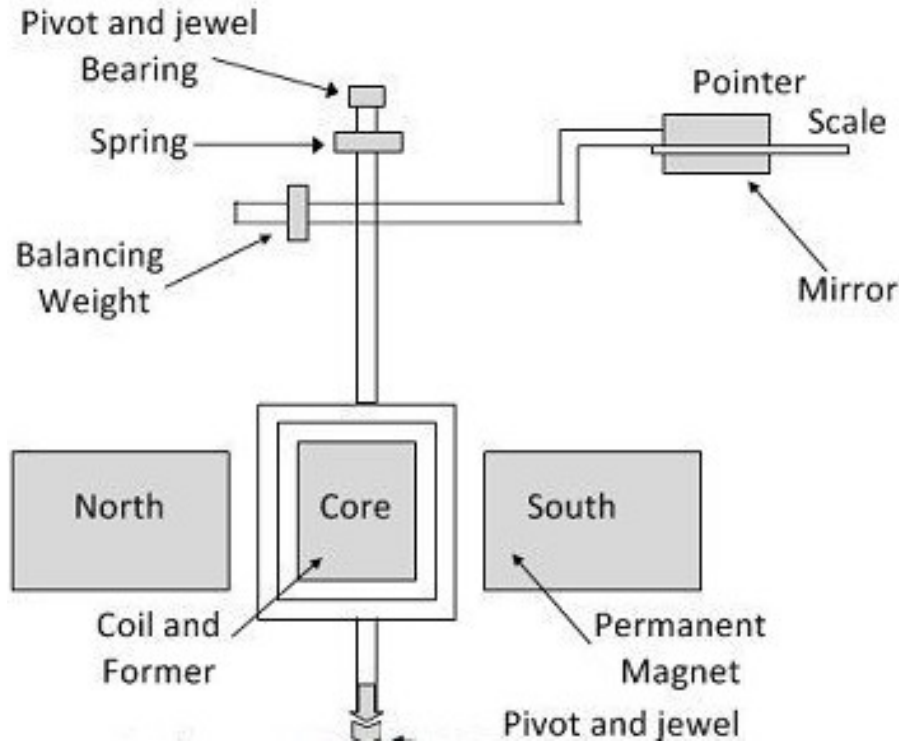
MOVING COIL INSTRUMENTS

Construction:

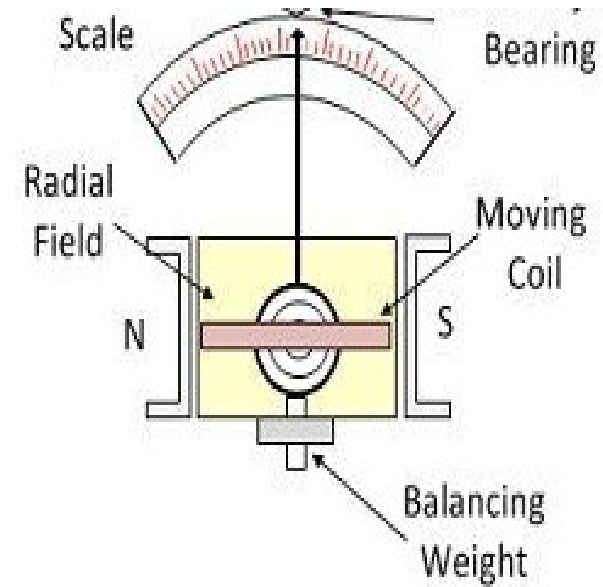
- A coil of thin wire is mounted on an aluminum frame (spindle) positioned between the poles of a U shaped permanent magnet which is made up of magnetic alloys like alnico.
- The coil is pivoted on the jewelled bearing and thus the coil is free to rotate.
- The current is fed to the coil through spiral 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.



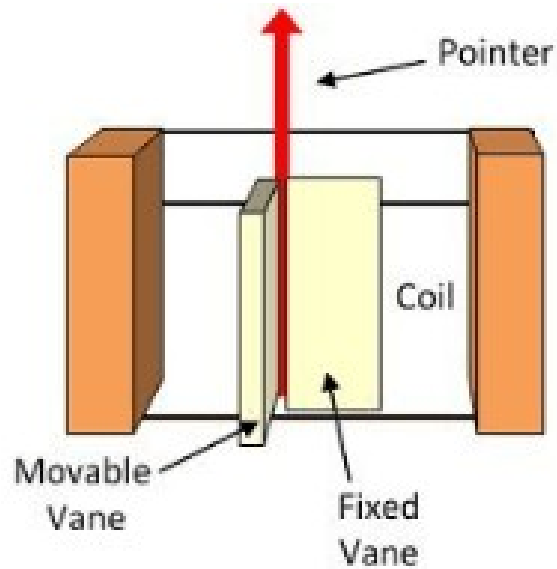
MOVING IRON INSTRUMENTS

Construction:

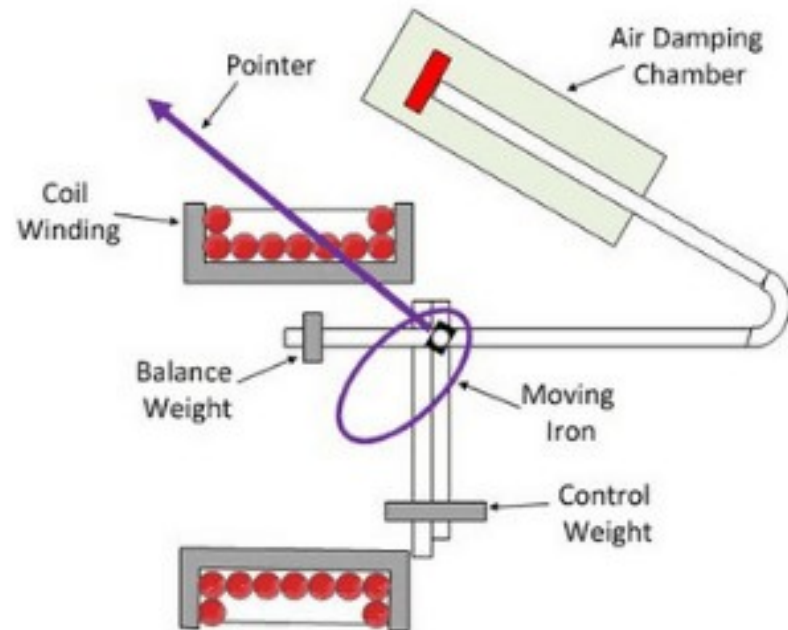
- The moving iron, i.e. the disc of soft iron, is eccentrically mounted.
- Coil is situated around the disc. When the coil is excited it produces magnetic field.
- Due to magnetic field the moving iron moves from the weaker field outside the coil to the stronger field inside the coil.
- Thus moving iron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

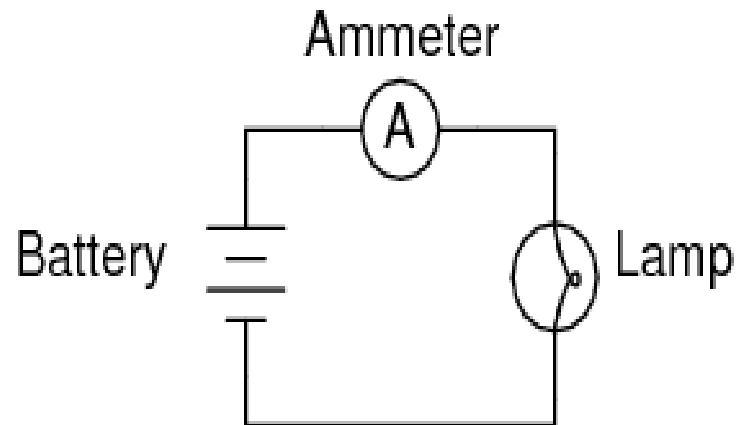
Disadvantages of MI:

- 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

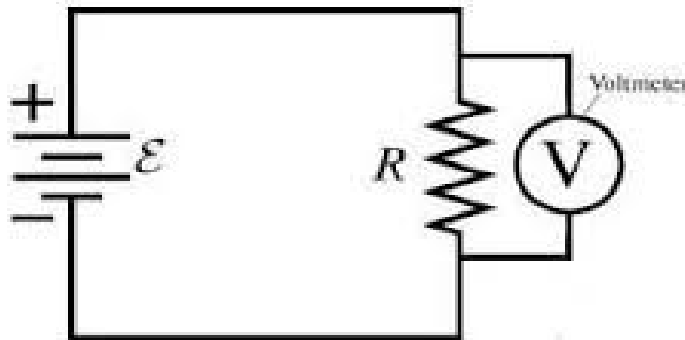
- **Connection diagram of an Ammeter:**
 - Ammeter is used for the measurement of current.
 - Ammeter is always connected in series with the load
 - Resistance offered by an ammeter is very small





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