SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Coimbatore-35

DEPARTMENT OF BIOMEDICAL ENGINEERING

23BMT203 - BIOMEDICAL TRANSDUCERS AND SENSORS

UNIT III- MEASUREMENT OF PRESSURE & BLOOD FLOW

II Year/ IV Sem

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ASP / BME / SNSCT

Direct Pressure Measurement

- ✓ Catheters type
- ✓ Diaphragm type

Indirect Pressure Measurement

- ✓ Doppler Ultrasound
- ✓ Applanation Method

Blood Flow Measurements

- ✓ Electromagnetic Blood Flow
- ✓ Ultrasonic Blood Flow

Ground Force Measurements

- ✓ Strain gauge type force plate
- ✓ Foot Force Distribution Measurements

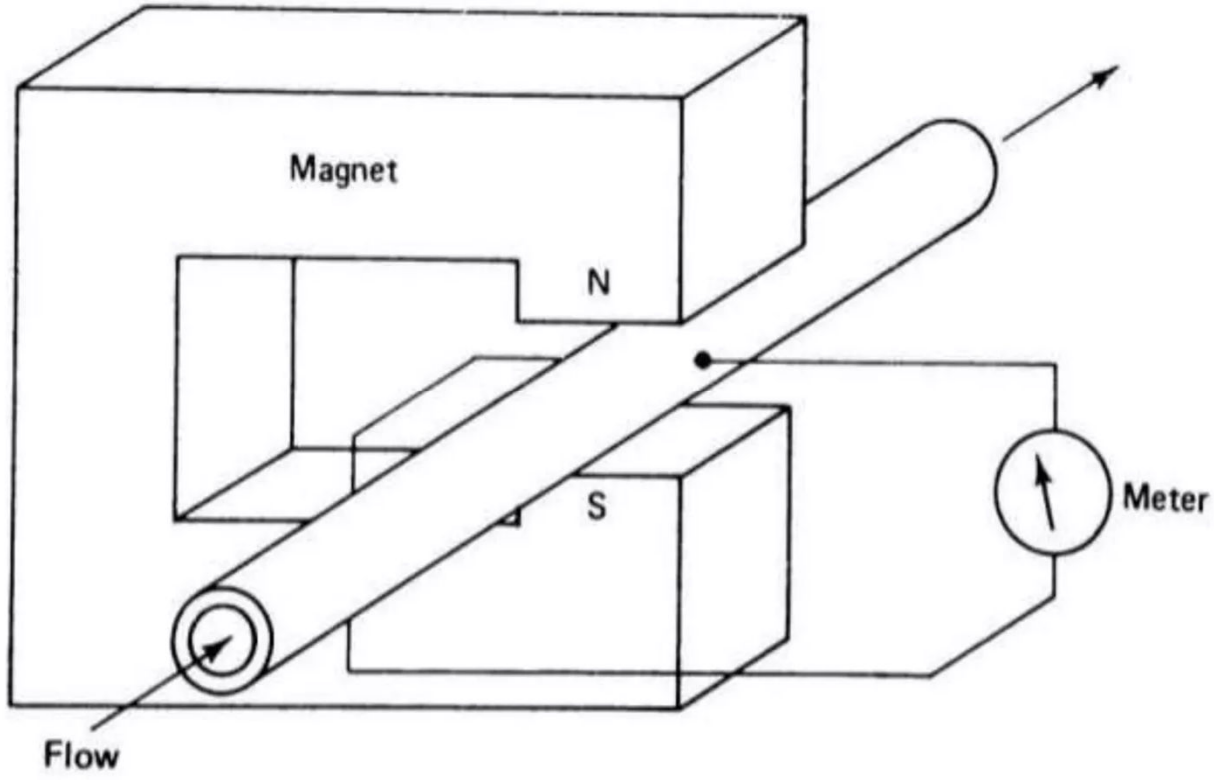
Blood Flow Measurements

- **Blood Flow Measurement** refers to the process of determining the **rate at which blood moves through vessels**, tissues, or organs.
- It is a crucial physiological parameter that helps assess **circulatory health**, **organ function**, and detect **vascular disorders**.

- **Flow Rate**: Volume of blood passing a point per unit time (e.g., mL/min).
- **Velocity**: Speed at which blood travels (e.g., cm/s).
- **Direction**: Normal vs. reversed or turbulent flow.

Electromagnetic Blood Flow Measurements

- **Electromagnetic blood flow measurement** is a technique that uses **Faraday's Law of Electromagnetic Induction** to **directly measure the flow of blood** through a vessel.
- It is primarily used in **research and surgical settings** to obtain real-time and accurate blood flow data.



Working Principle Electromagnetic Blood Flow

1. A **magnetic field** is applied perpendicular to the direction of blood flow.
2. As **ion-rich blood** (a conductive fluid) flows through the vessel, it cuts through the magnetic field.
3. This movement induces a **voltage** (EMF) perpendicular to both the magnetic field and flow direction.
4. The **generated voltage is proportional** to the **velocity of the blood flow**.
5. Electrodes placed on the vessel wall detect this voltage and send it to a processing unit.

Advantages Electromagnetic Blood Flow

- Direct and continuous measurement of blood flow
- Highly accurate for pulsatile and steady flows
- Works well with large vessels
- Useful in both in vitro and in vivo studies
- Not affected by blood pressure or vessel elasticity

Disadvantages Electromagnetic Blood Flow

- Invasive – requires direct contact with the vessel
- Not suitable for small or deep vessels
- Sensitive to movement artifacts and electrical noise
- Requires calibration and stable conditions
- Rarely used clinically due to complexity

Applications Electromagnetic Blood Flow

- Cardiovascular research (measuring flow in arteries during surgery)
- Organ perfusion studies
- Animal experiments for understanding blood dynamics
- Evaluation of vascular grafts and shunts