

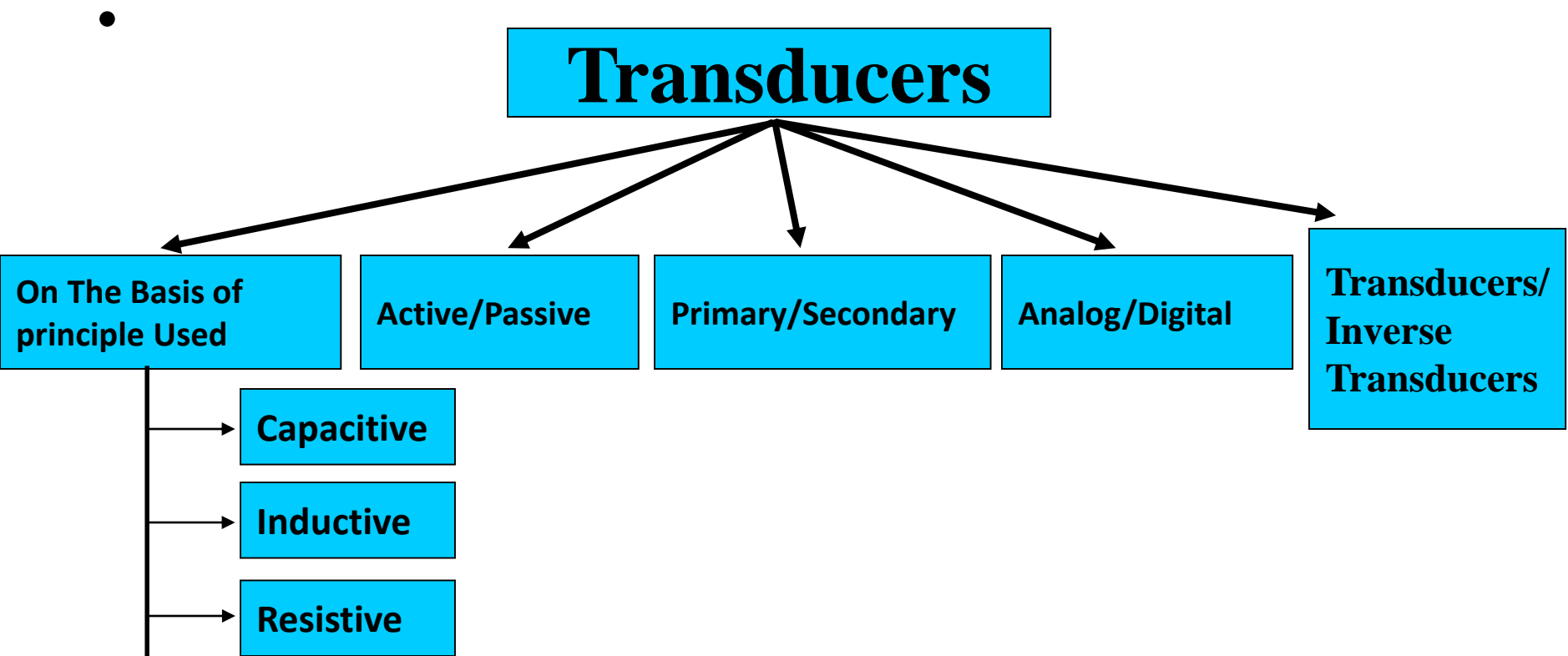
Powerpoint Presentation  
on  
**Classification of  
Transducers**

# Transducers

- A Transducer is a device which converts one form of energy into another form.
- Alternatively, a Transducer is defined as a device which provides usable output response to a specific input measured which may be a physical quantity.
- A Transducer can also be defined as a device when actuated by energy in one system supplies energy in the same form or in another form to a second system.

# Classification of Transducers

- Transducers may be classified according to their application, method of energy conversion, nature of the output signal, and so on.

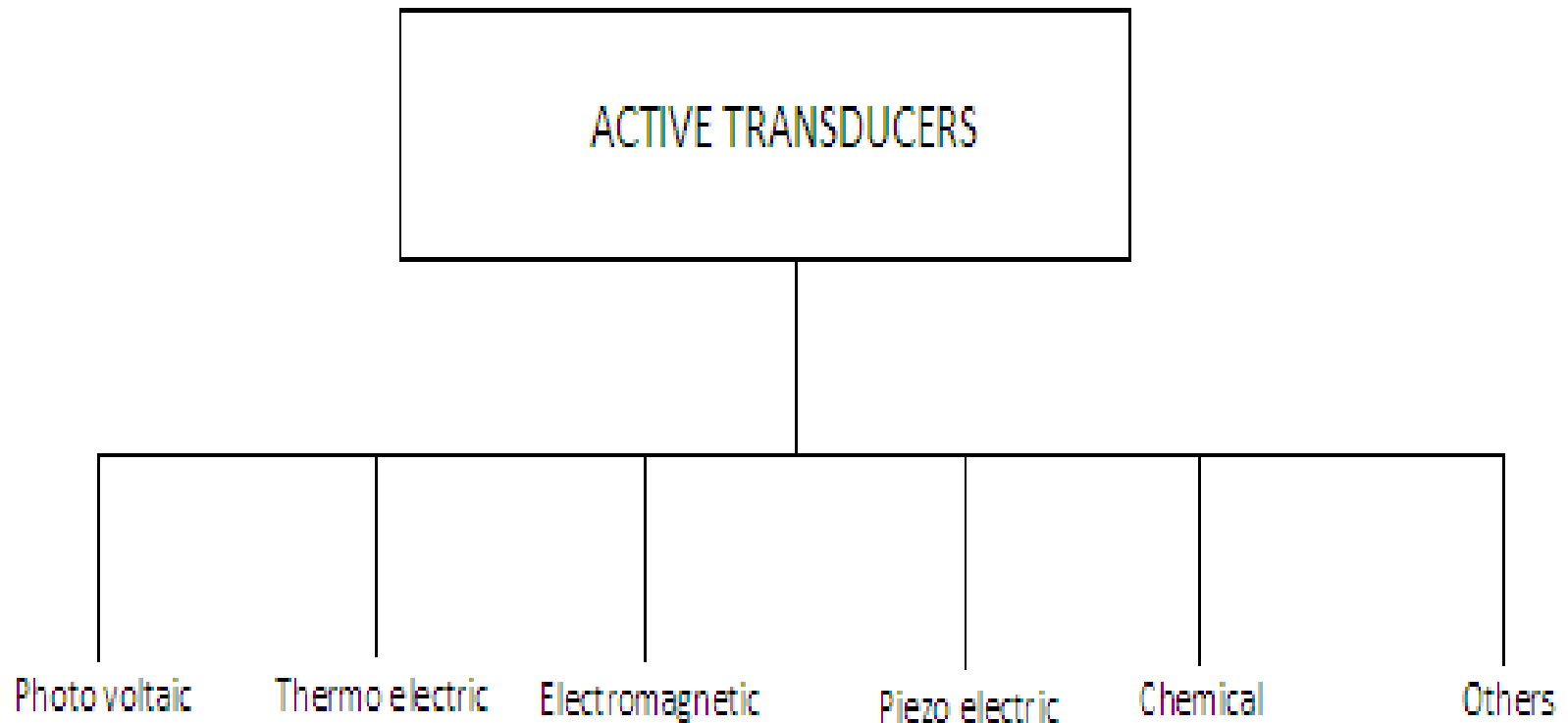


# Active and Passive Transducers

- **Active transducers :**

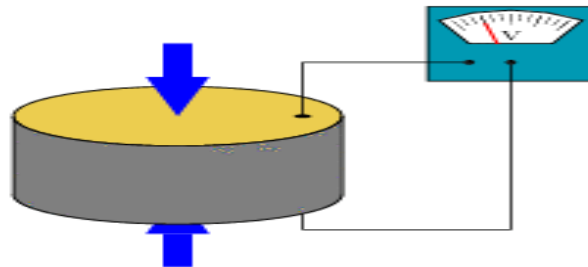
- These transducers do not need any external source of power for their operation. Therefore they are also called as self generating type transducers.
  - I. The active transducer are self generating devices which operate under the energy conversion principle.
  - II. As the output of active transducers we get an equivalent electrical output signal e.g. temperature or strain to electric potential, without any external source of energy being used

# Classification of Active Transducers



# Example of active transducers

- **Piezoelectric Transducer-** When an external force is applied on to a quartz crystal, there will be a change in the voltage generated across the surface. This change is measured by its corresponding value of sound or vibration.



# Passive Transducers

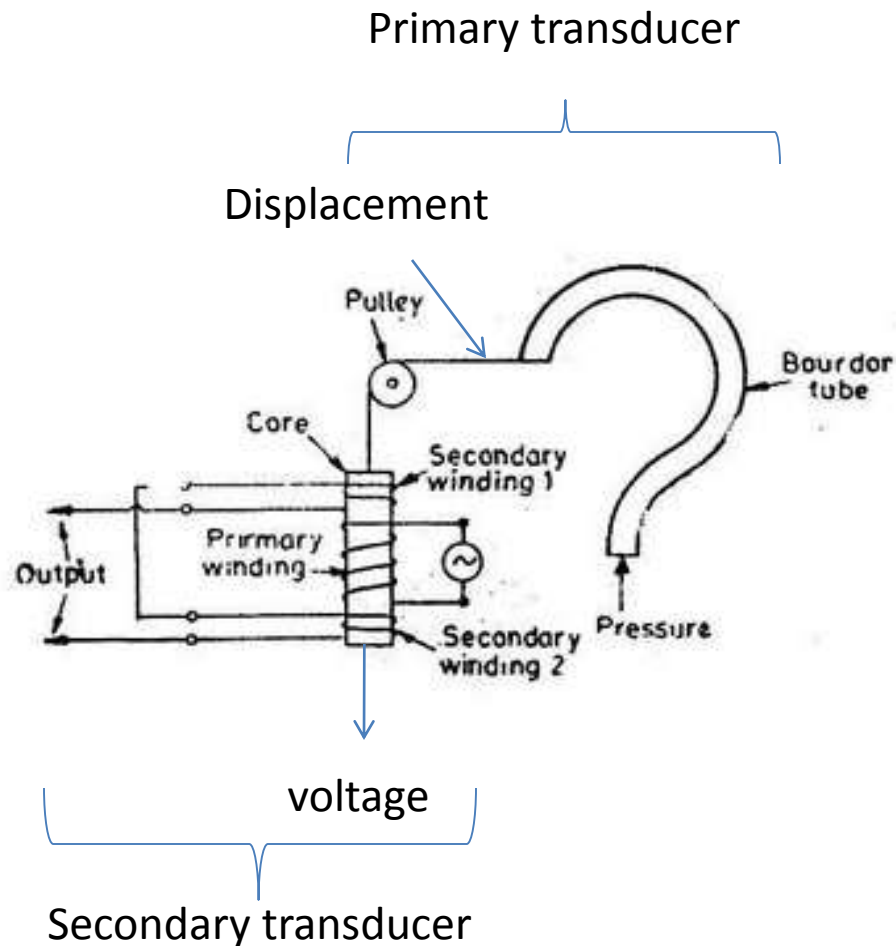
- These transducers need external source of power for their operation. So they are not self generating type transducers.
- A DC power supply or an audio frequency generator is used as an external power source.
- These transducers produce the output signal in the form of variation in electrical parameter like resistance, capacitance or inductance.
- Examples – Thermistor, Potentiometer type transducer

# Primary and Secondary Transducers

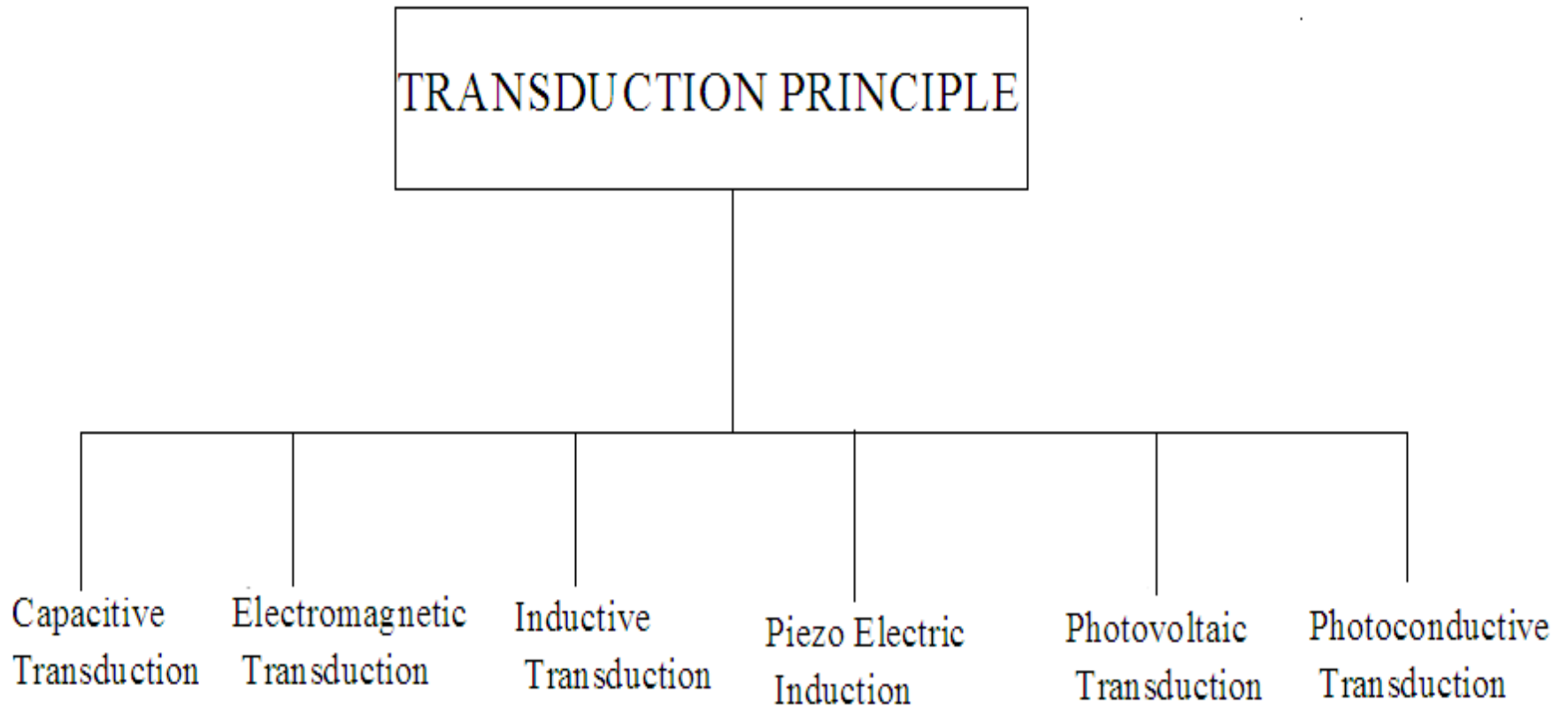
- Some transducers contain the mechanical as well as electrical device. The mechanical device converts the physical quantity to be measured into a mechanical signal. Such mechanical device are called as the primary transducers, because they deal with the physical quantity to be measured.
- The electrical device then convert this mechanical signal into a corresponding electrical signal. Such electrical device are known as secondary transducers.



# Example of Primary and secondary transducer

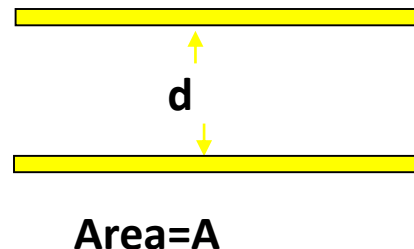


# According to Transduction principle used



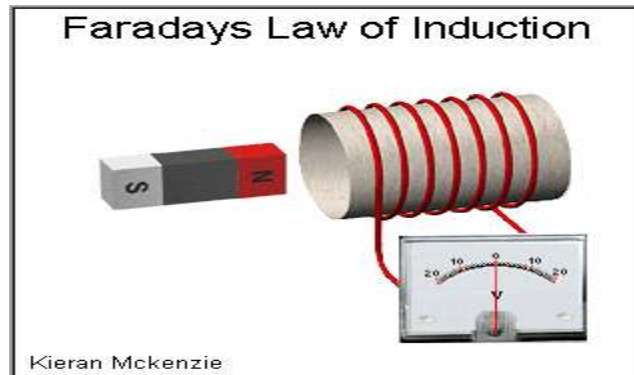
## Capacitive Transduction:

- Here, the measurand is converted into a change in capacitance.
- A change in capacitance occurs either by changing the distance between the two plates or by changing the dielectric.



## Electromagnetic transduction:

- In electromagnetic transduction, the measurand is converted to voltage induced in conductor by change in the magnetic flux, in absence of excitation.
- The electromagnetic transducer are self generating active transducers
- The motion between a piece of magnet and an electromagnet is responsible for the change in flux



## Inductance Transduction:

- In inductive transduction, the measurand is converted into a change in the self inductance of a single coil. It is achieved by displacing the core of the coil that is attached to a mechanical sensing element

## Piezoelectric Transduction:

- In piezoelectric induction the measurand is converted into a change in electrostatic charge  $q$  or voltage  $V$  generated by crystals when it is mechanically stressed.

## Photovoltaic Transduction:

- In photovoltaic transduction the measurand is converted to voltage generated when the junction between dissimilar material is illuminated.

## Photoconductive Transduction:

- In photoconductive transduction the measurand is converted to change in resistance of semiconductor material by the change in light incident on the material.

# Analog and Digital Transducers

## Analog transducers:

- These transducers convert the input quantity into an analog output which is a continuous function of time.
- Thus a **strain gauge, an L.V.D.T., a thermocouple or a thermistor** may be called as Analog Transducers as they give an output which is a continuous function of time.

## Digital Transducers:

- These transducers convert the input quantity into an electrical output which is in the form of pulses and its output is represented by 0 and 1.



# Transducer and Inverse Transducer

## Transducer:

- Transducers convert non electrical quantity to electrical quantity.

## Inverse Transducer:

- Inverse transducers convert electrical quantity to a non electrical quantity. A piezoelectric crystal acts as an inverse transducer because when a voltage is applied across its surfaces, it changes its dimensions causing a mechanical displacement.