CHANDIGARH UNIVERSITY

Discover. Learn. Empower.

INSTITUTE-UNIVERSITY INSTITUTE OF ENGINEERING

ACADEMIC UNIT-II

Computer Science Engineering

Subject Name-Biology For Engineers

Subject Code- 20SZT148

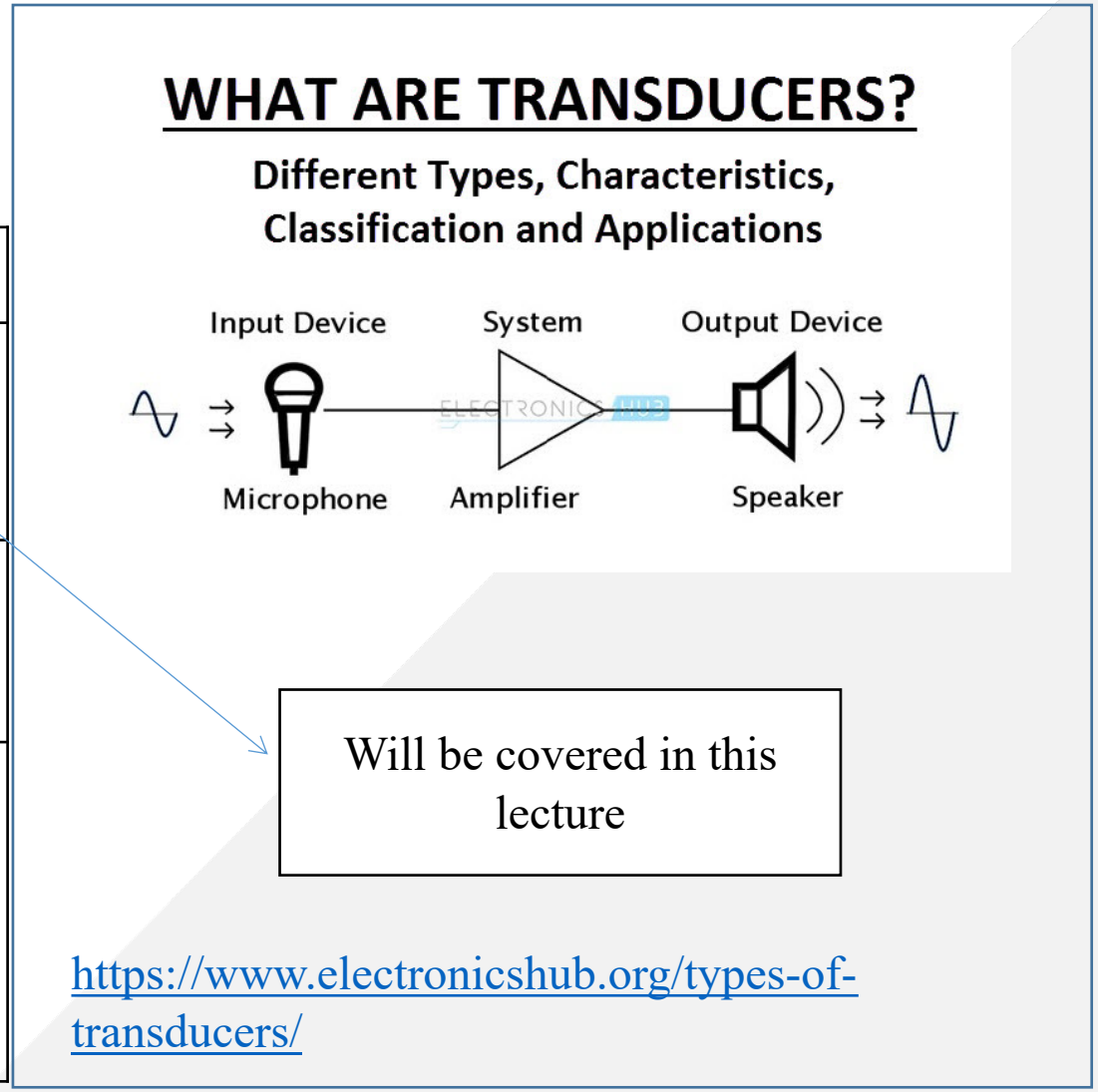
TYPES OF TRANSDUCERS

DISCOVER . LEARN . EMPOWER

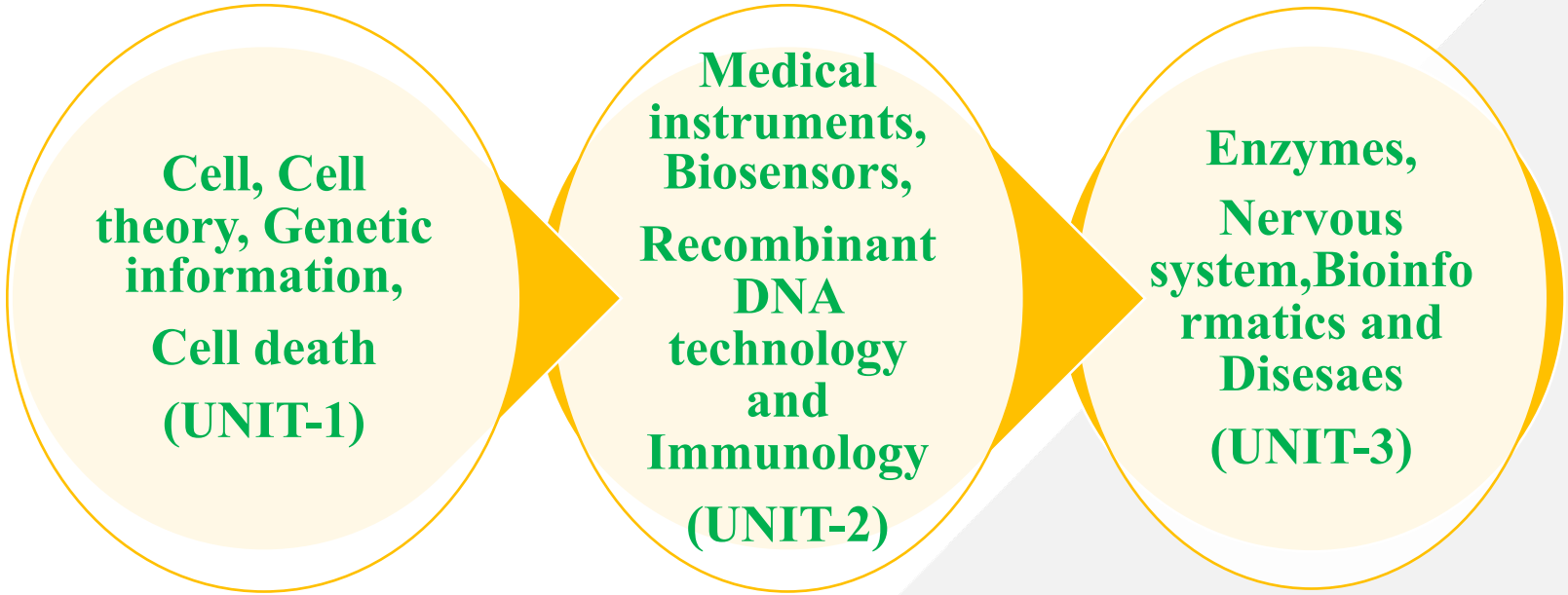
TYPES OF TRANSDUCERS

Course Outcome

CO Number	Title	Level
CO1	It gives an idea about the about the basic cell biology.	**Understanding**
CO2	It deals with the idea of uses of biology in engineering.	**Understanding**
CO3	It provide knowledge about the uses of softwares in biology field.	**Remembering**



BIOLOGY FOR ENGINEERS



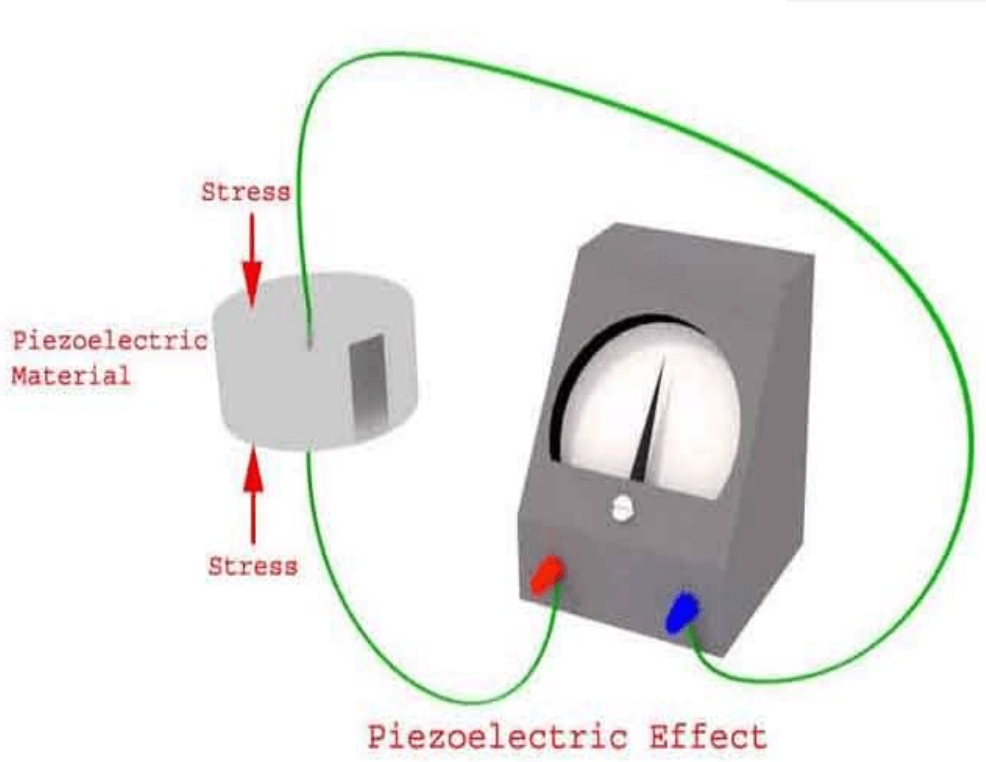
TYPES OF TRANSDUCERS

- **Analog transducers -** converts input signal into output signal, which is a continuous function of time e.g. Thermistor , strain gauge, LVDT , thermocouple etc.
- **Digital transducers -** converts input signal into the output signal in the form of pulses e.g. it gives discrete output.
- **Primary transducers-** When the input signal is directly sensed by the transducers and physical phenomenon is converted into the electrical form directly.E.g. thermistor
- **Secondary Transducers :**The input signal is sensed first by some detector or sensor and then its output being of some form other than input signal is given as input to a transducer for conversion into electrical from.E.g. LVDT

PIEZOELECTRIC TRANSDUCERS

- Transducers used to convert mechanical energy into electrical energy.
- mostly used in the music industry for detecting the impact of a drummer stick on a drum pad
- used to detect muscle movements (acceleromyography)

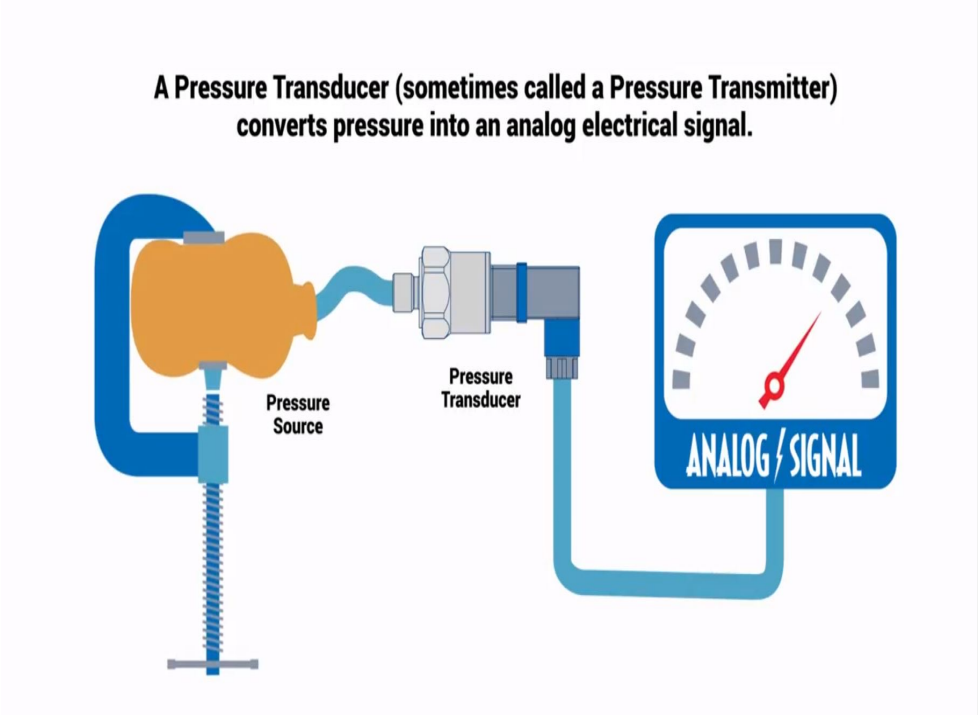
used in automotive management systems to detect engine failures



https://www.electrical4u.com/piezoelectric-transducer/

PRESSURE TRANSDUCERS

- sensors that convert the pressure that is imposed on electrical signals
- usually used to measure the amount of pressure of a particular quantity such as liquid or gas
- practical applications of pressure sensors include altitude, level and depth sensing

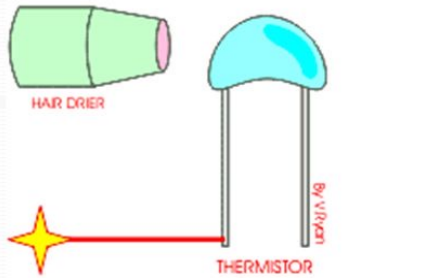


https://www.omega.com/en-us/resources/pressure-transducers-how-it-works

TEMPERATURE TRANSDUCERS

8.10 Thermistor Transducers.

- ☑ Have ***great resistance*** at low temperatures but when they warm up their resistance decreases rapidly.
- ☑ Current can then flow through them.
- ☑ When the thermistor is warmed up by the hair drier its resistance drops.
- ☑ As its resistance drops, current flows into the base of the transistors allowing the LED to light, **Figure 8.9**.



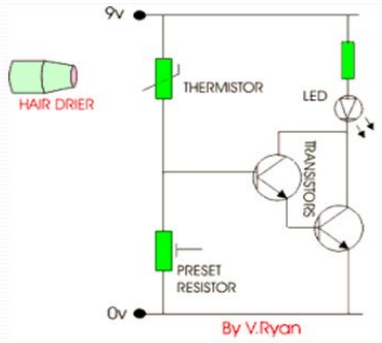


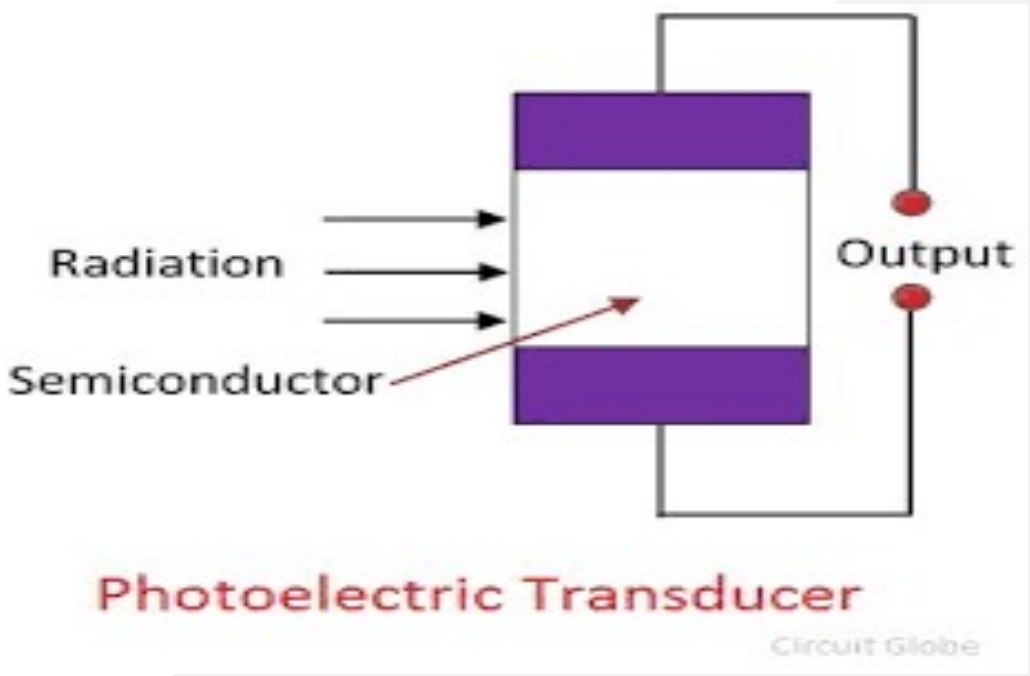
Figure 8.9: Thermistor Transducers.

https://slideplayer.com/slide/6111972/

- Thermometric biosensors are in use for the estimation of serum cholesterol. When cholesterol gets oxidized by the enzyme cholesterol oxidase, heat is generated which can be measured. Likewise, estimations of glucose (enzyme-glucose oxidase), urea (enzyme-urease), uric acid (enzyme-uricase) and penicillin G (enzyme-P lactamase) can be done by these biosensors. In general, their utility is however, limited.

PHOTOELECTRIC TRANSDUCERS

- Convert light energy into electrical energy.
- When light falls on photosensing element , electric current is generated that is measured directly or after amplification.
- **Photoelectric effect-** it is the ejection of electrons from metal or semiconductor surface when illuminated by light or any radiation of suitable wavelength



https://circuitglobe.com/photoelectric-transducer.html

PHOTOELECTRIC TRANSDUCERS

A) **Passive transducers**- includes photoemissive cells and photoconductive cells

B) **Active transducers**- includes photovoltaic cells

- **Photo-emissive cells**
  A device which detects or measures radiant energy by measurement of the resultin g emission of electrons from the surface of a photocathode.
- **The photoconductive cell** - A two terminal semiconductor device whose terminal **resistance** will vary (linearly) with the intensity of the incident light
- **photovoltaic cells**- When radiant energy falls on semiconductor surface, it excites the electrons at silver-selenium interface. These electrons are collected at cathode

DISPLACEMENT TRANSDUCERS

- Displacement transducers are devices intended to convert the motion of an object or machine into electromagnetic, magnetoelectric, or electrostatic signals. These signals are read and interpreted into data.
- An LVDT sensor is a type of displacement transducer used explicitly in measuring linear displacement. LVDT or linear variable displacement transducer produces output in voltage which is directly related to the parameter which is measured.
- A linear displacement transducer is a reliable device with displacement measurement of up to several inches long. An lvdt can function as an absolute sensor with repeatable and reproducible results. The device itself contains three sliding cores which do not come in contact with the tube, hence, increasing its reliability and robustness.

FLOW TRANSDUCERS

- Flow transducers are used to measure air and liquid flow velocity.
- Mainly used in the heating, ventilation and conditioning sectors.
- Flow transducers can be easily installed in ventilation ducts

Flow Transducers

- Measure flow of gases, liquids, or solids
  - Given as:
    - Q = (area) (velocity)

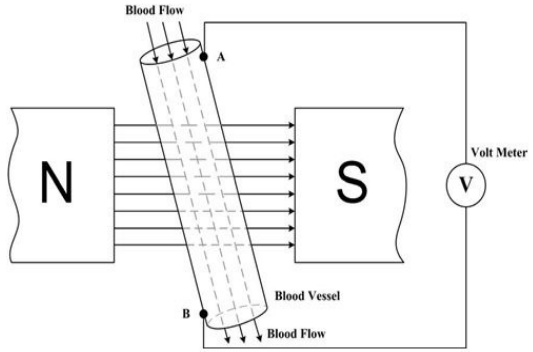


FIGURE 6-17
A simple flow transducer

CONCLUSION

- The word “Transducer” is the collective term used for both Sensors which can be used to sense a wide range of different energy forms such as movement, electrical signals, radiant energy, thermal or magnetic energy etc, and Actuators which can be used to switch voltages or currents.
- A transducer receives sequences of high voltage electrical pulses called transmit pulses from the echosounder.
- When the wave of sound bounces back, the transducer acts as a microphone.
- It receives the sound wave during the time between each transmit pulse and converts it back into electrical energy.

ASSESSMENT PATTERN

Assessment Pattern	Total Marks
1st Hourly Test	36
2nd Hourly Test	36
Surprise Test	12
Assignment (3)	10
Quiz	4
End Semester Examination	60

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THANK YOU

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