# PHY109 ASSIGNMENT

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Section : **KOC01**

Roll no : **RKOC01A36**

Semester : **Second**

Submission Date : **8th May 2022**

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# TOPIC:

# SENSOR APPLICATION OF OPTICAL FIBER

# INTRODUCTION:

- A fiber-optic sensor is a sensor that uses optical fiber either as the sensing element, or as a means of relaying signals from a remote sensor to the electronics that process the signals .

- These sensors are used to sense some quantities like temperature, pressure, vibrations, displacements, rotations or concentration of chemical species. Fibers have so many uses in the field of remote sensing because they require no electrical power at the remote location and they have tiny size.

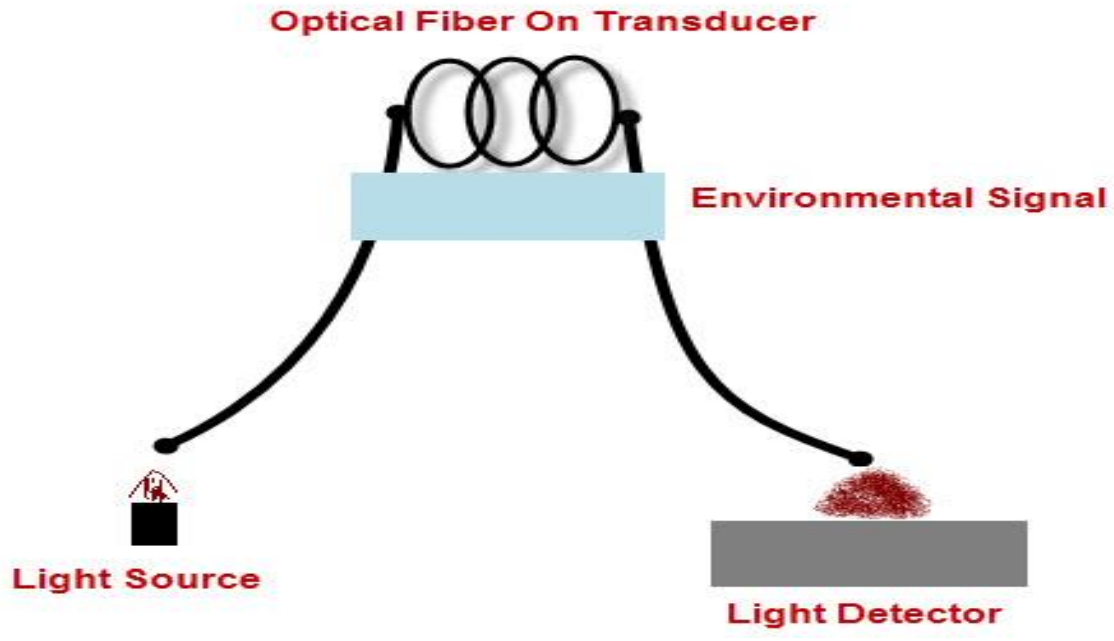
- Fiber optic sensors are supreme for insensitive conditions, including noise, high vibration, extreme heat, wet and unstable environments. Fiber-optic sensors are also immune to electromagnetic interference, and do not conduct electricity so they can be used in places where there is high voltage electricity or flammable material such as jet fuel. Fiber-optic sensors can be designed to withstand high temperatures as well.

# TYPES OF FIBRE OPTIC SENSORS:

## 1-Intrinsic Type Fiber Optic Sensors:

- In this type of sensors, sensing takes place within the fiber itself. The sensors depend on the properties of the optical fiber itself to convert an environmental action into a modulation of the light beam passing through it.

- ADVANTAGE: The most useful feature of the intrinsic fiber optic sensor is, it provides distributed sensing over long range distances.

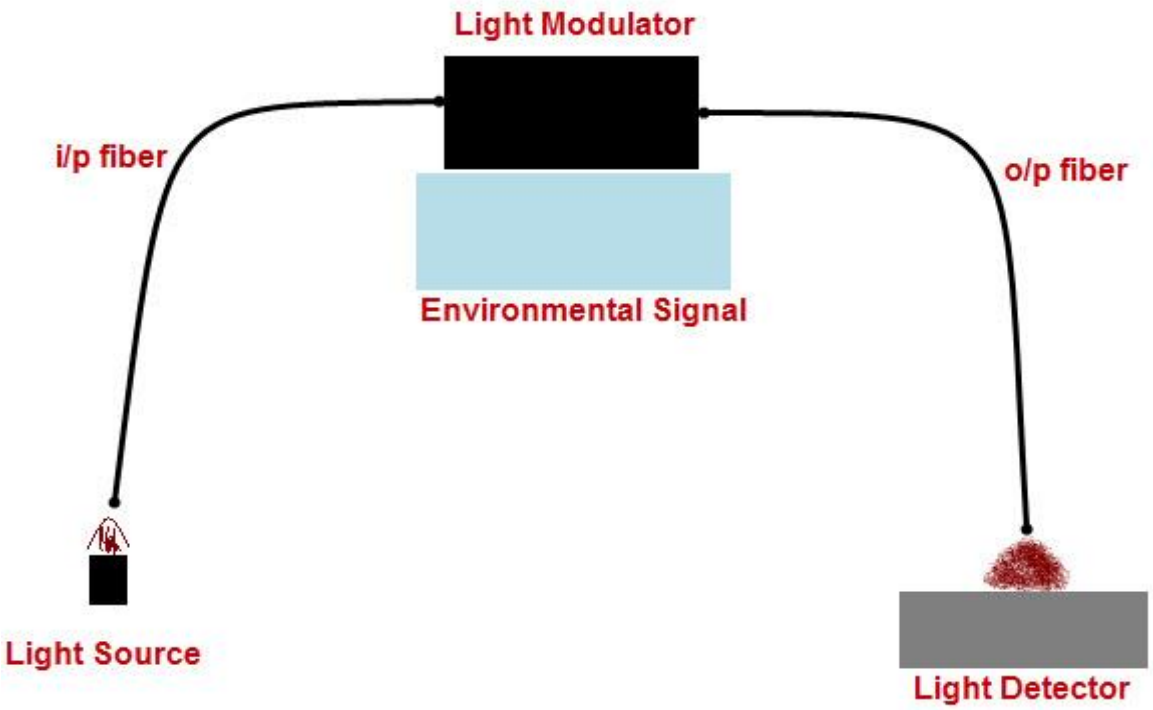



Intrinsic type fiber optic sensors

## 2- Extrinsic Type Fiber Optic Sensor:

- In extrinsic type fiber optic sensors, the fiber may be used as information carriers that show the way to a black box. It generates a light signal depending on the information arrived at the black box. The black box may be made of mirrors , gas or any other mechanisms that generates an optical signal.

- ADVANTAGES:
  1-These sensors are used to measure rotation, vibration velocity, displacement, twisting, torque and acceleration.
  2-The major benefit of these sensors is their ability to reach places which are otherwise unreachable.

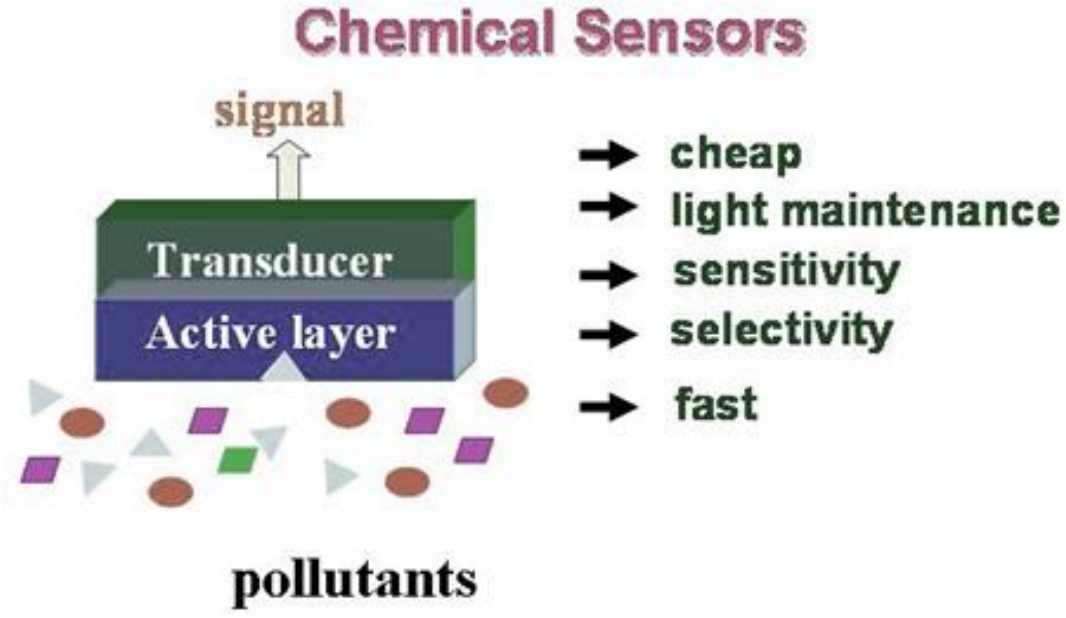



Intrinsic type fiber optic sensors

# APPLICATIONS:

## 1-Chemical Sensor

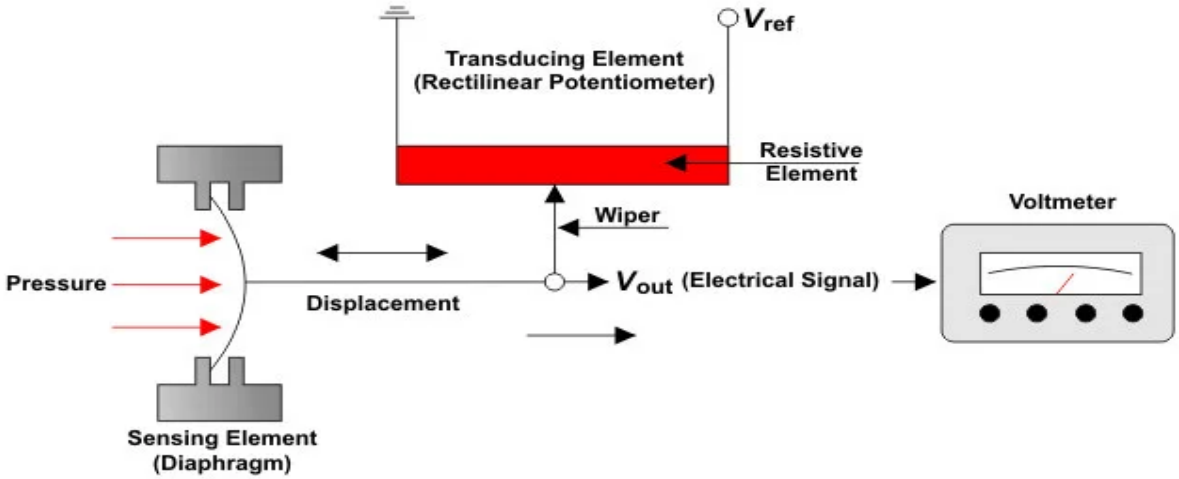
- A chemical sensor is a device which is used to transform chemical information in the form of a measurable physical signal that is associated with the concentration of a certain chemical species.
- The Chemical sensor is an important component of an analyzer and may include some devices that perform the following functions: signal processing, sampling, and data processing. An analyzer may be an important part of an automated system.
- The working of analyzer according to a sampling plan as a function of time acts as a monitor. These sensors include two functional units: a receptor and a transducer. In the receptor part, the chemical information is transformed into an energy that may be measured by the transducer. In the transducer part, the chemical information is transformed into an analytical signal and it does not show sensitivity.



# 1-Physical Sensor

- A physical sensor is a device that is made according to the physical effect and nature.
- These sensors are used to provide the information about a physical property of the system.
- This type of sensors are mostly signified by sensors such as photoelectric sensors, piezoelectric sensors, metal resistance strain sensors and semiconductor piezo-resistive sensors.

Photoelectric sensor




piezoelectric sensors

## 3-Bio Medical Sensor

- Biomedical sensor is an electronic device that is used to transfer various non- electrical quantities in biomedical fields into easily detectable electrical quantities. Due to this reason, these sensors are included in health care analysis. This sensing technology is the key to collecting human pathological and physiological information.
- Applications of Fiber Optic Sensors

1-Fiber optic sensors are used in a varied range of applications such as measurement of physical properties such as temperature, displacement, velocity, strain in structures of any size or any shape.

2-In real time, monitoring the physical structure of health.

3-Buildings and bridges, tunnels, Dams, heritage structures

4-Night vision camera, electronic security systems, Partial discharge detection and measuring wheel loads of vehicles.

# CONCLUSION:

Fiber optic sensor technology has been under development for the past 40 years and has resulted in the production of various devices, including fiber optic gyroscopes; sensors of temperature, pressure, and vibration; and chemical probes. Fiber optic sensors offer a number of advantages, such as increased sensitivity compared to existing techniques and geometric versatility, which permits configuration into arbitrary shapes. Because fiber optic sensors are dielectric devices, they can be used in high voltage, high temperature, or corrosive environments. In addition, these sensors are compatible with communications systems and have the capacity to carry out remote sensing. The development and commercialization of optical fiber sensors has increased in recent years. The area of application of optical fiber sensors is now well identified, and its extension toward sensor systems optoelectronics has contributed to a wide range of applications in diverse fields. However, the continuous technological progress in diverse fields establishes new challenges for the development and instrumentation of reliable optical fiber sensor systems and devices with high performance. The investigation and development of new materials that combine electrical and optical properties, such as the conductive polymers, open the possibility of new optoelectronic devices, such as sensor systems and their implementation with optical fibers.

# REFERENCE

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