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BIOMEDICAL ENGINEERING
18/ENG02/087

BME 311 ASSIGNMENT

1) Describe briefly (with examples) sensors and Actuators for bromedical Applications

Sensors

Sensors Sense or detect the physrological parametes or input under observation and converts it into a Suitable usable electrical form.

For example;

- RTD/Thermistor for temperature,
- Strain Gauge for Pressure
- Ultrasonic / Laser Doppler meter for blood flow rate. etc.

Actuators

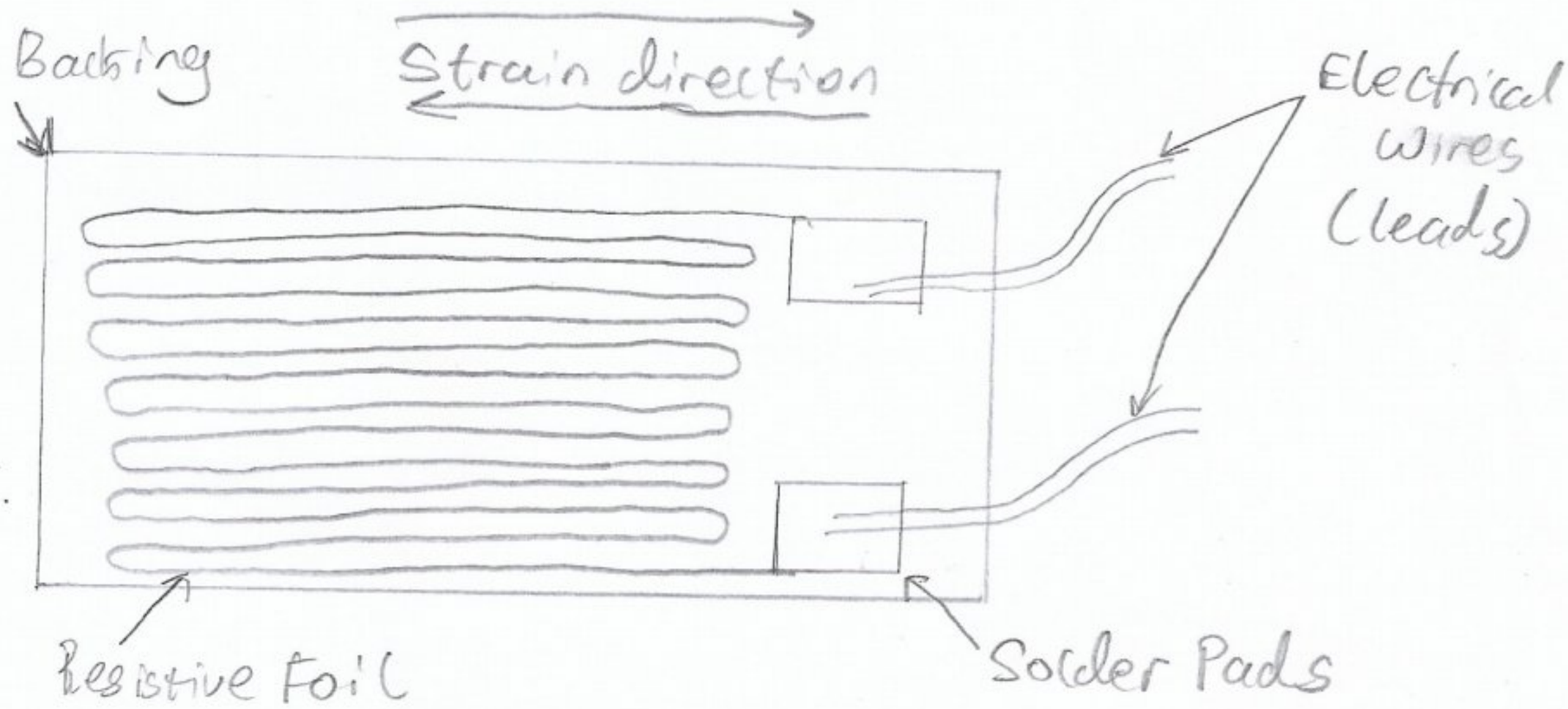
An actuator operates in the reverse direction of a Sensor. It takes an electrical input and turns it into Physical action. Actuators react. whenever there is an ~~output~~ input acquired from sensors, the actuators react i.e it provides a mechanical response.

For example;

- Alarms,
- LEDS,
- Displays, etc.

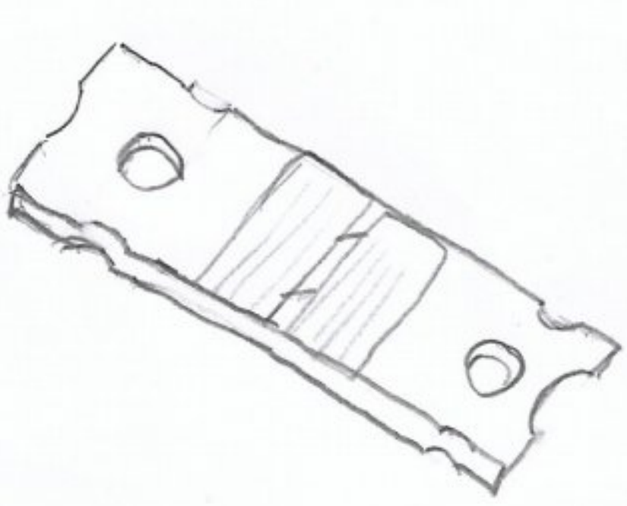
2a Strain Gdges

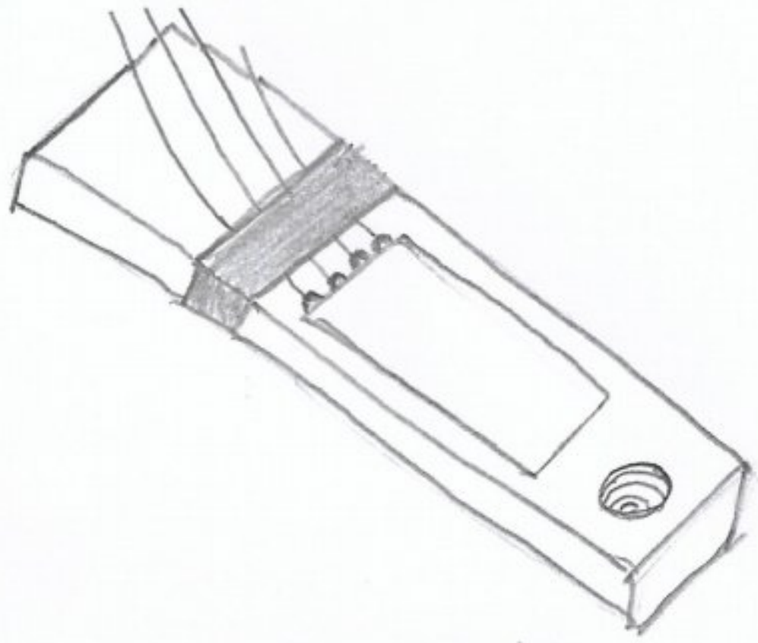
Strain gauges consist of a very fine metallic foil etched in a grid Patteon, which is bonded to a deurce and used to measure the strain, or amount of defoormation of the deurce when weight or pressure is applied

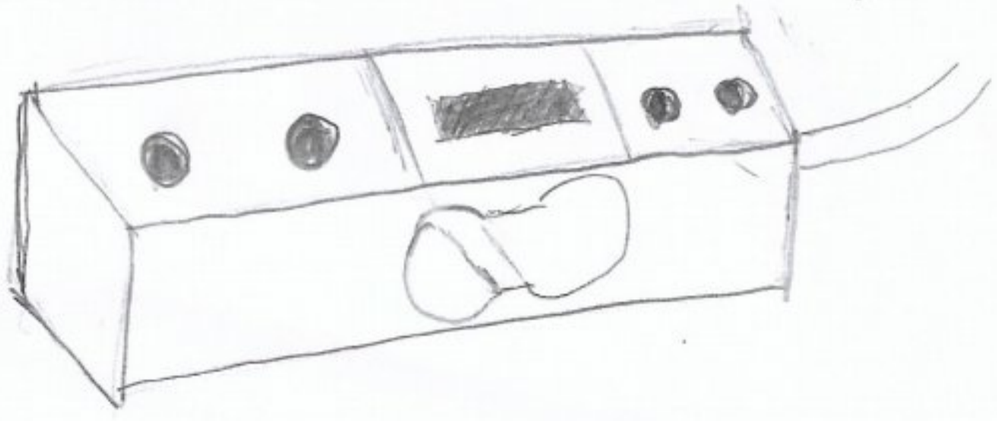


b) Force sensors

The force sensors are sensors for mass production that use Strain gauges

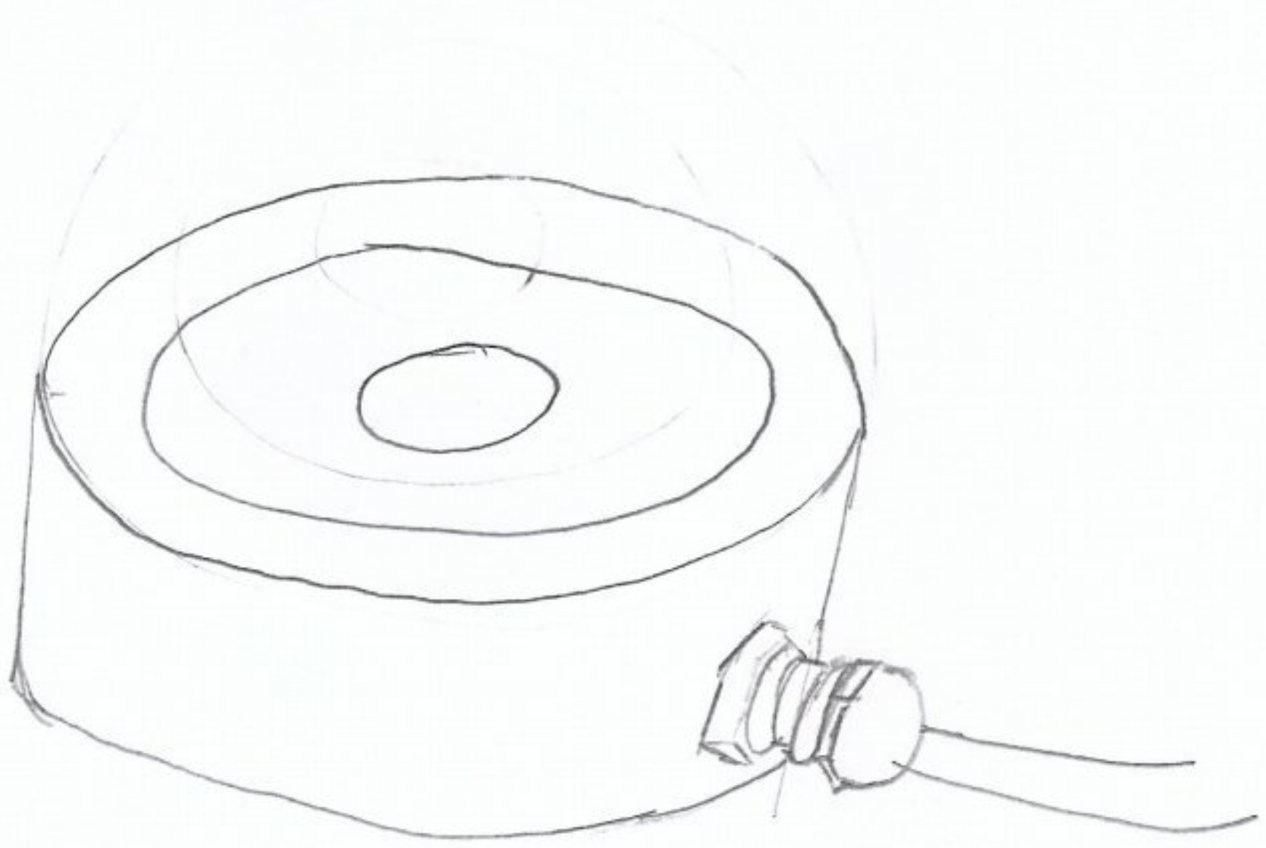






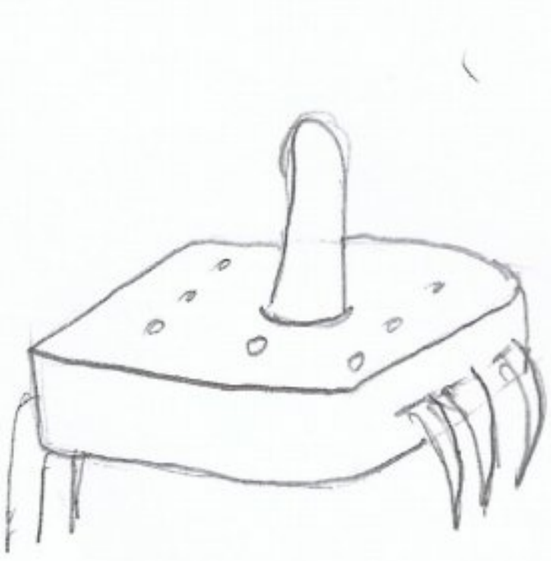
C). Load Cells

Load Cells ~~are~~ used Strain gaiges to Convert Weight into Electrical Output.



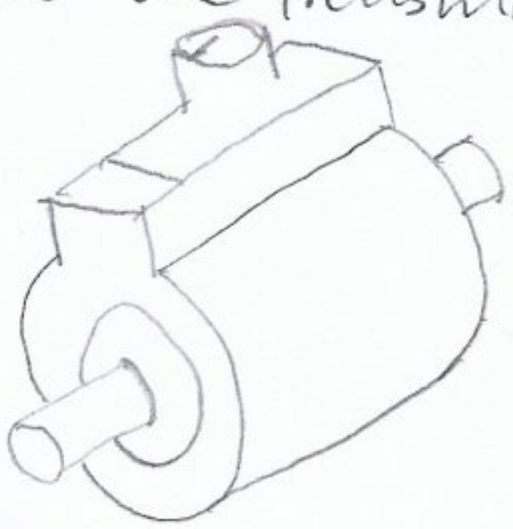
D). Pressure Sensor

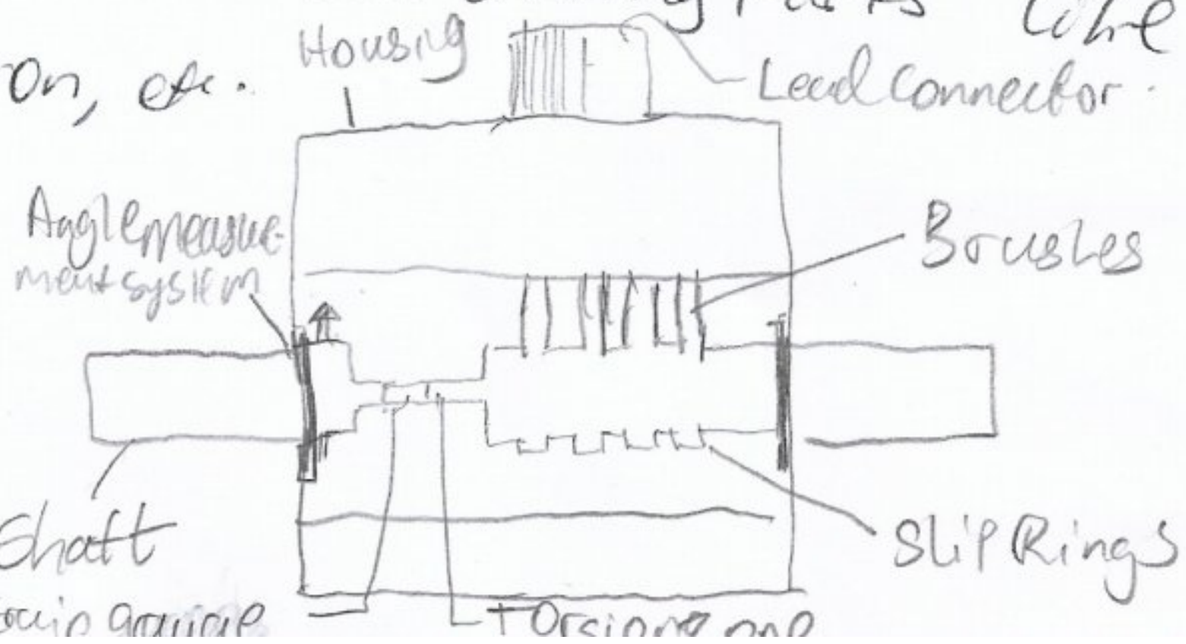
Using Strain gauge, these Pressure sensors are sensors that measure pressure as electric signals



E). Torque tranducers

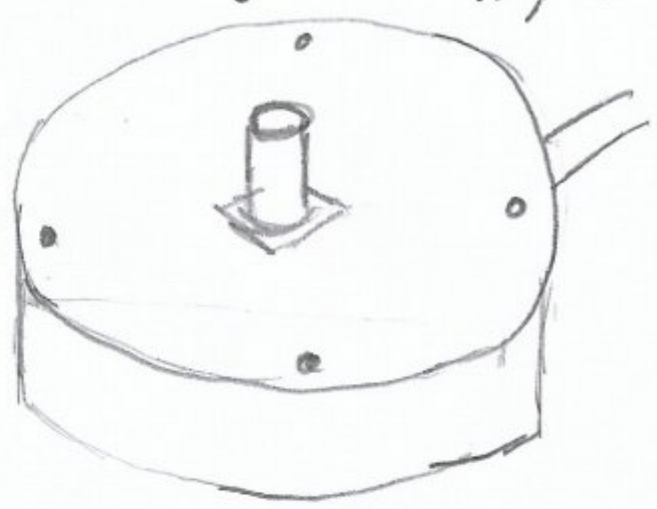
The sensors for torque measurement measures the twist with a strain gauge in various driving Parts like the engine and the transmission, etc.





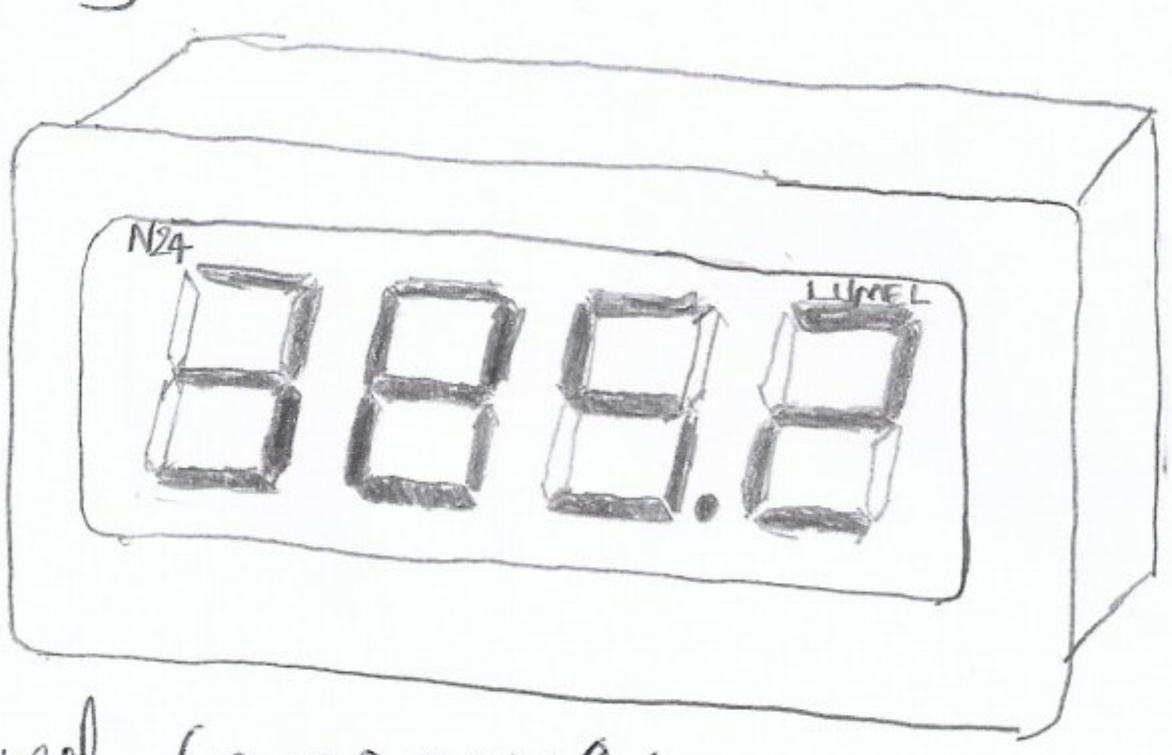
F) Vector Sensors

The vector sensor is a sensor that detects the translation power in three directions. The sensor can miniaturize because of a simple structure and is the best for the usage of the gripping force detection, etc.



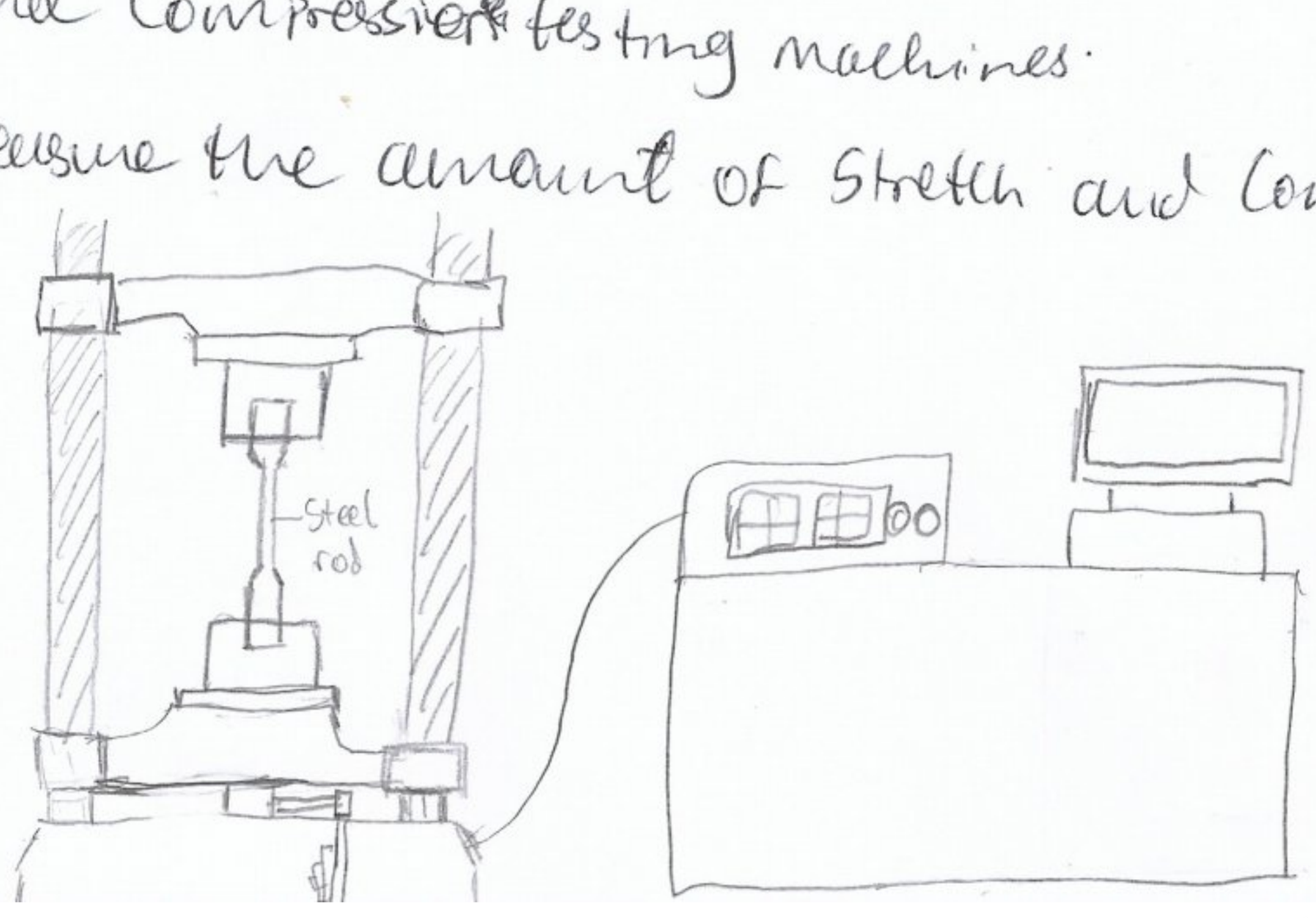
G) Digital Indicators

Digital indicators are used for its load cells, transducers and other measuring components.



H) Tensile and Compression testing machines.

Used to measure the amount of stretch and contraction of devices



3 Describe briefly Case studies of two medical measurement instruments

Sphygmomanometer

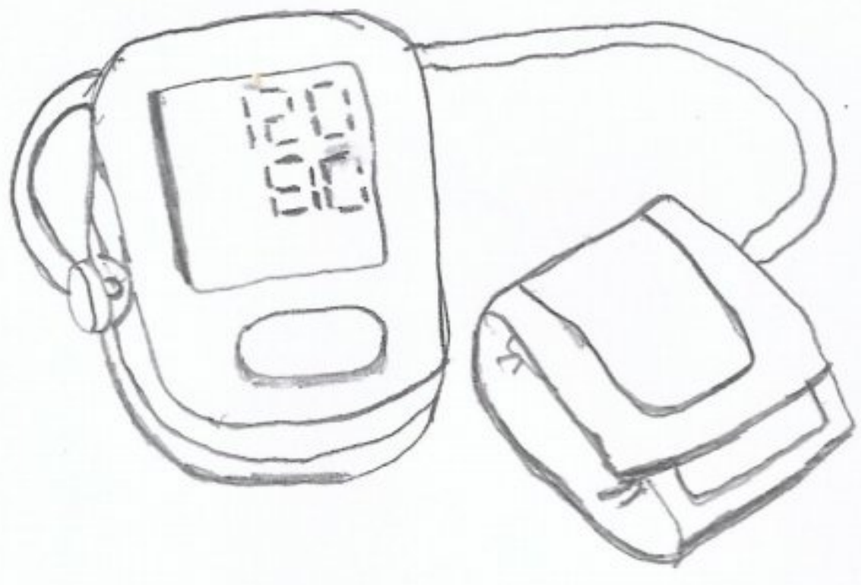
A sphygmomanometer is a device used to measure blood pressure, composed of an inflatable cuff to collapse and then release the arteries under the cuff in a controlled manner, and a mercury or aneroid manometer to measure the pressure.

There are two types of splygmomanometers;

- The manual splygmomanometer and,
- The digital splysmomanometer.

By observing the mecury in the column, or the aneroid gauge pointer, while releasing the air pressure with a control valve, the operator notes the values of the blood pressure in mm Hg. The peak pressure in the arteries during the cardiac cycle is the Systolic pressure, and the lowest pressure (at the resting phase of the cardiac cycle) is the diastolic pressure.

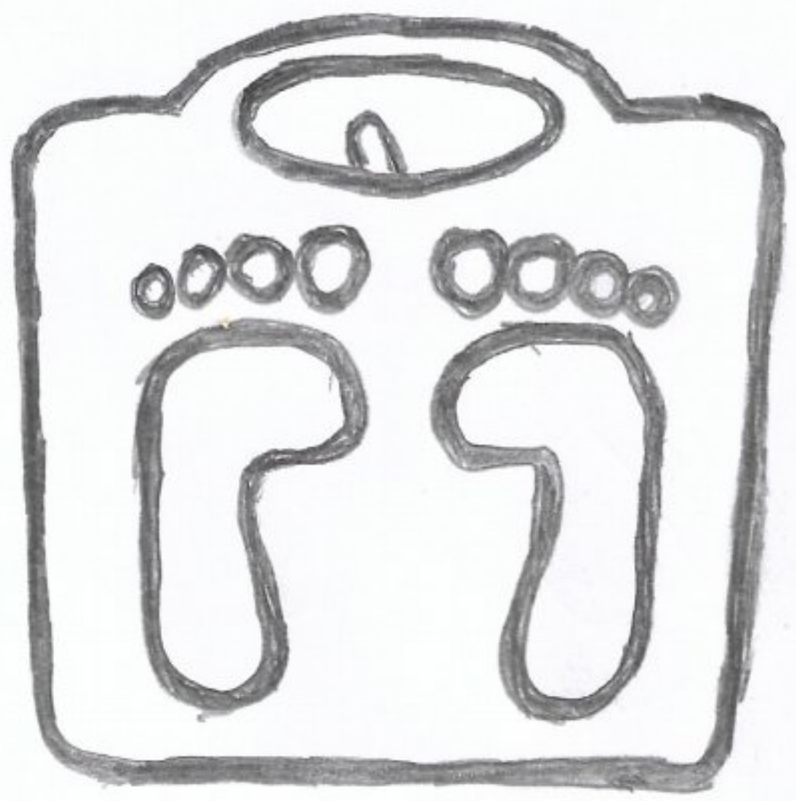
Measurement of blood pressure is carried out in the diagnosis and treatment of hypertension (high blood pressure), and in many other health care scenarios.



A SPHYGMOMANOMETER

Weighing Scale

A beam balance is a device to measure weight or mass
A traditional scale consist of two plates or bowls
Suspended at equal distances from a fulcrum.
One plate holds an object of unknown mass/weight, while known masses are added to the other plate until static equilibrium is achieved and the plates level off.
Electronic digital scales as which we are using/being used often, display weight as a number, usually on a Liquid Crystal display (LCD). They are versatile because they may perform calculations on the measurement and transmit it to other digital devices. In a digital scale, the force of the weight causes a spring to deform, and the amount of deformation is measured by one or more transducers called strain gauges.



A WEIGHING SCALE