EEE 319

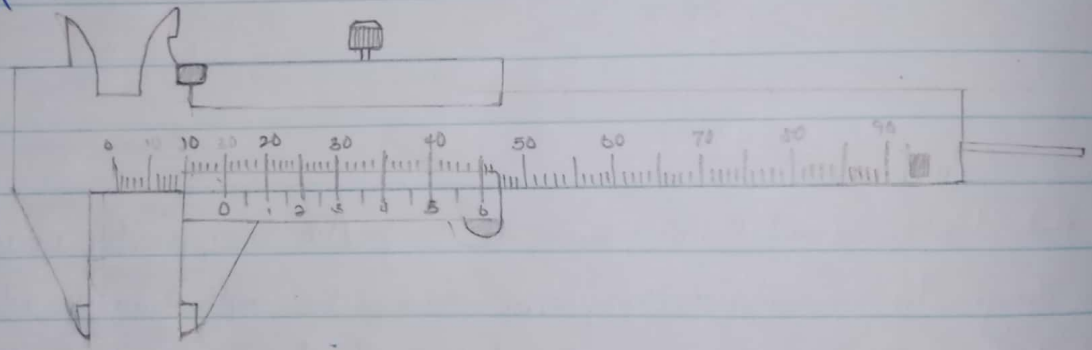
IKEJIAKU OJU DIVINE

18/ENG02/047

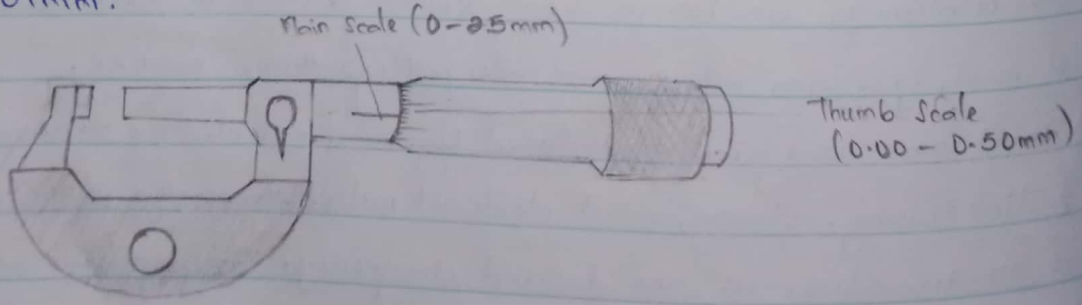
COMPUTER ENGINEERING

1) Sensors & actuators are very critical components in all devices and measurement systems. Biomedical sensors are used to gain the information on body and technology, which is a branch of biomedical engineering. Biomedical sensors are classified into physical sensor, chemical sensor and biosensor. In biomedical field, examples of biomedical sensors are; Oxygen and carbondioxide sensor for blood, Piezoelectric heart sound sensor, Respirator sensor e.t.c. Types of biomedical actuators are MEMS actuators.

a) Vernier caliper: widely used linear measurement instrument with a least count of 0.02mm. It is used to measure linear dimensions like length, diameter, depth.

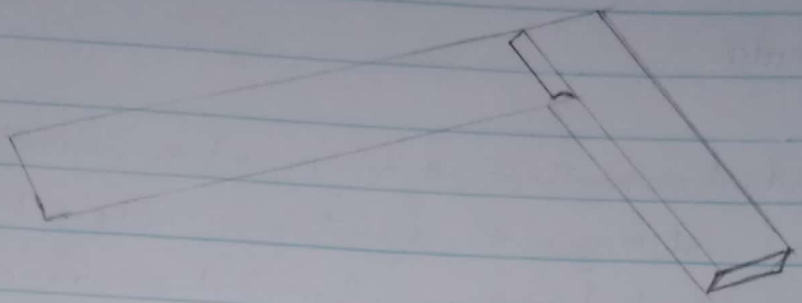


(b) Micrometer: External micrometer is also known as Outside micrometer. It is used to check outside diameter of circle by the means of accuracy of 0.01mm or up to 0.001mm.

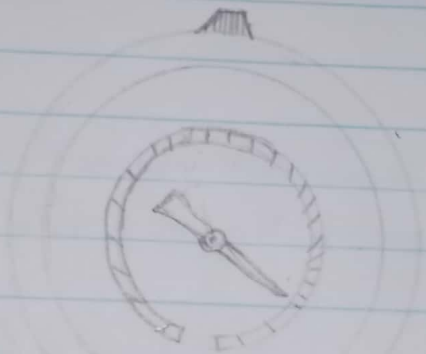


(c) Engineering Square: A ruler can be used to draw straight lines but there is no guaranty that the line is drawn is accurate and exactly straight.

this is where the engineering square is brought into use.



d) Hygrometer: This is an instrument used to measure the amount of water vapor in air, in soil, or in confined spaces.



3)a) Medical ultrasound (also known as diagnostic sonography or ultrasonography) is a diagnostic imaging technique, or therapeutic application of ultrasound. It is used to create an image of internal body structures such as tendons, muscles, joints, blood vessels and internal organs. Its aim is often to find a source of a disease or to exclude pathology.

The creation of an image from sound is done in three steps - producing a sound wave, receiving echoes and interpreting those echoes.

A sound wave is typically produced by a piezoelectric transducer encased in a plastic housing. Strong, short electrical pulses from the ultrasound machine drive the transducer at the desired frequency. The frequencies can be anywhere between 1 and 18MHz, through frequencies up to 50 - 100 megahertz have been used experimentally in a technique known as biomicroscopy in special regions, such as the anterior chamber of the eye.

the return of the sound wave to the transducer results in the same process as sending the sound wave, except in reverse. The returned sound wave vibrates the transducer and the transducer turns the vibrations into electrical pulses that travel to the ultrasonic scanner where they are processed and transformed into a digital image.

To make an image, the ultrasound scanner must determine two things from each received echo:

a) How long it took the echo to be received from when the sound was transmitted

b) How strong the echo was.

Once the ultrasonic scanner determines these two things, it can locate which pixel in the image to light up and to what intensity.

Images from the ultrasound scanner are transferred and displayed using the DICOM standard. Normally, very little post processing is applied to ultrasound images.

b) Proctoscopy is a common medical procedure in which an instrument called a proctoscope (also known as a rectoscope) although the is used to examine the anal cavity, rectum or sigmoid colon. A proctoscope is a short, straight, rigid, hollow metal tube, and usually has a small light bulb mounted at the end. It is approximately 5 inches or 15cm long, while a rectoscope is approximately 10 inches or 25cm long. During proctoscopy, the proctoscope is lubricated and inserted into the rectum, and then the obturator is removed allowing an unobstructed view of the interior of the rectal cavity. This procedure is normally done to inspect for hemorrhoids or rectal polyps and might be mildly uncomfortable as the proctoscope is inserted further into the rectum. Modern fibre-optic proctoscopes allow more extensive observation with less discomfort.