ROHINI

COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

24ME403 - METROLOGY & MEASUREMENTS

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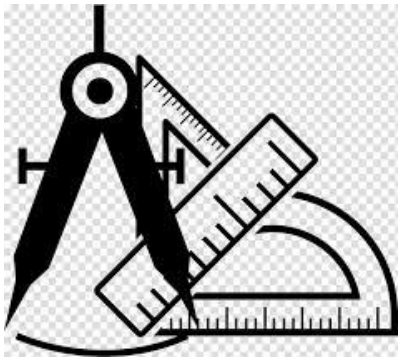


UNIT II: MEASUREMENT OF LINEAR AND ANGULAR DIMENSIONS

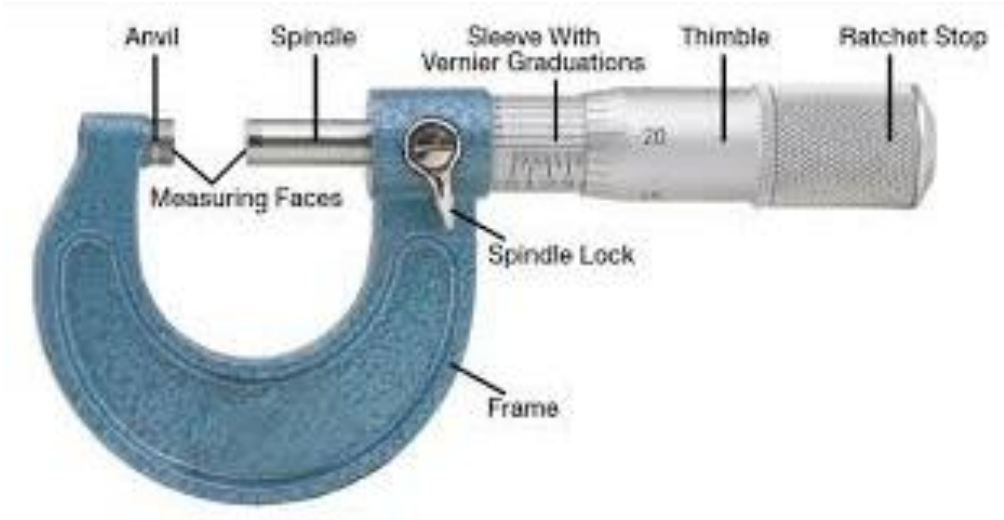
CO2: To make use of the principle; applications of linear and angular measuring instruments in the assembly and transmission elements.

Micrometer

- A micrometer is a precision measuring instrument used to obtain extremely accurate dimensional readings, typically to within one-thousandth of a mm.
- It operates on the principle of a precision screw mechanism that converts small rotational movements of a thimble into precise linear displacement of a spindle.

Parts of a Micrometer:

1) **Frame**: The C-shaped body that provides structural rigidity and holds all components together.
2) **Anvil**: The fixed, hardened steel contact point against which the object is placed for measurement.
3) **Spindle**: The moving, threaded shaft that advances toward the anvil to contact the object being measured.
4) **Sleeve (or Barrel)**: The stationary cylindrical part with a linear scale (main scale) engraved along its length.
5) **Thimble**: The rotating sleeve attached to the spindle, with a circular vernier scale around its circumference.



6) **Ratchet stop (or friction thimble)**: A spring-loaded device at the end of the thimble that ensures consistent measuring pressure to prevent overtightening.
7) **Lock nut (or lock ring)**: A lever or ring used to clamp and lock the spindle in place to retain a measurement.
8) **Spindle screw**: The precision internal screw mechanism inside the sleeve that converts the thimble's rotation into linear spindle movement.

Measurement procedure:

i. Close the micrometer's spindle gently against the anvil and verify zero alignment. Note any zero error for later correction.
ii. Rotate the thimble counterclockwise to open the spindle, then place the workpiece straightly between the spindle and anvil.
iii. Turn the ratchet stop clockwise until it clicks, ensuring consistent and gentle contact without overtightening.
iv. Secure the measurement by engaging the locking lever or locknut to prevent movement.
v. Read the pitch scale reading (mm), and thimble scale coincidence.
vi. Calculate the thimble scale reading, and determine the total reading.
Thimble Scale Reading (TSR) = Thimble Scale Coincidence (TSC) × Least Count (LC)
- Total Reading = Pitch Scale Reading (PSR) + Thimble Scale Reading (TSR)

vii. Adjust the measured value by adding or subtracting any previously noted zero error.