MEB 460 - METROLOGY & MEASUREMENT AND MACHINE TOOL TESTING
PRACTICAL

OBJECTIVES:
- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools.
- Obtain accurate measurements.
- Set up instrument for machine tool testing.
- Observe the machine tool alignment and results.
- Observe the manufacturing accuracy of machine tools.

Note:
- The students should be given training in both sections (Part-A & Part-B). All the exercises should be completed and the students should maintain record notebook for the concerned exercise and submit during the Board Practical Examinations.

METROLOGY & MEASUREMENT
Syllabus:
1. Introduction to linear measurement
2. Introduction to angular measurement
3. Introduction to geometric measurements
4. Linear Measuring Instruments Vernier / Caliper / Micrometer /
   Inside Micrometer / Vernier Height gauge / Depth Gauge and Slip Gauge.
6. Geometric measurement - Gear tooth Vernier caliper / Thread micrometer

PART- A

Exercises:
METROLOGY & MEASUREMENT:
I. LINEAR MEASUREMENTS:

1. Determine the thickness of ground MS flat to an accuracy of 0.02mm using vernier caliper.
2. Determine the diameter and length of cylindrical objects to an accuracy of 0.02mm using vernier caliper.
3. Determine the inside diameter of a bush component to an accuracy of 0.02 using vernier caliper.
4. Determine the diameter of a cylindrical component to an accuracy of 0.01mm using micrometer and check the result with digital micrometer
5. Determine the height of gauge block or parallel bars to an accuracy of 0.02mm using vernier height gauge.
6. Determine the depth of a blind bore component to an accuracy of 0.02mm using vernier depth gauge.
7. Determine the thickness of ground MS plates using slip gauges

II. ANGULAR MEASUREMENTS:
8. Determine the angle of V-block, Taper Shank of Drill and Dovetails in mechanical components using universal bevel protractor.
9. Determine the angle of machined surfaces of components using sine bar with slip gauges.

III. GEOMETRIC MEASUREMENT
10. Measure the geometrical dimensions of V-Thread
11. Measure the geometrical dimensions of spur gear.
PART - B

MACHINE TOOL TESTING

**Geometrical Test:** Position of machine tool components and displacement of machine tool components relative to one another is checked.

The instruments required for Geometrical tests are Dial Gauge, test mandrel, Straight edge, Squareness, sprit level.

- Test for level of installation of machine tool in Horizontal and Vertical Planes.
- Test for Flatness of machine bed and for straightness and parallelism of bed ways on bearing surface.
- Test for perpendicular of guide ways to other guide ways or bearing surface.
- Test for true running of the main spindle and its axial movements.
- Test for parallelism of spindle axis to guide ways or bearing surfaces.
- Test for line of movements of various members like spindle and table cross slides.
- Practical test in which some test pieces are done and their accuracy and finish is checked.

1. Testing of Lathe machine alignments and prepare a test chart.
   a) Level of lathe.
   b) True running of spindle.
   c) Alignment of both centers.
   d) Parallelism of main spindle to saddle movements.

2. Testing of Shaping machine alignments and prepare a test chart.
   a) Level of machine.
   b) Table top parallel to its transverse movement.
   c) Ram movement parallel to table top.

3. Testing of Tool and Cutter grinder alignments and prepare a test chart.
   a) Level of Tool and Cutter.
   b) True running of spindle.
   c) Parallelism of Table top to its movement.

4. Testing of Pillar type drilling machine alignments and prepare a test chart.
   a) Level of the Drilling machine.
   b) True running of Spindle Taper.
   c) Squareness of Spindle axis with Table.

5. Testing of Surface Grinding machine alignments and prepare a test chart.
   a) Level of the Surface Grinding Machine.
   b) Parallelism of Table Top to its movement.
   c) Parallelism of Spindle axis to the Table Top.
   d) Squareness of Table with Vertical movement of Spindle.

6. Testing of Milling machine alignments and prepare a test chart.
   a) Level of the Machine
   b) Cutter Spindle Axial slip
   c) True running of internal Taper.
   d) Table surface parallel with Arbor.
   e) Test on Column.

7. Testing of Slotting machine alignments and prepare a test chart.
   a) Level of the Slotting machine.
   b) Ram movement perpendicular to the Table Top.
   c) Table Top parallel to its transverse movement.
# SCHEME OF AUTONOMOUS EXAMINATION

<table>
<thead>
<tr>
<th>Exercises</th>
<th>Duration</th>
<th>Max. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part A</strong></td>
<td>1 Hr</td>
<td>25</td>
</tr>
<tr>
<td>Metrology (Linear/Angular/Geometric)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least Count Calculation/ Tabulation</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Reading/ Calculation</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Result</td>
<td>05</td>
<td></td>
</tr>
<tr>
<td><strong>Part B</strong></td>
<td>2 Hrs</td>
<td>45</td>
</tr>
<tr>
<td>Machine Tool Alignment / Mechanical measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawing/Procedure</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Alignment test /Calculation</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Result &amp; Test Chart</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Viva-voce</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>75</td>
</tr>
</tbody>
</table>