

Module 400 – Lesson Two: Measurement & Engineering Drawings I

Lesson Description:

Introduction to measurement, blueprints and engineering drawings (history, types, visualization, Title Block, lines, views, etc.). Use of basic measuring tools (scales, tape measure and protractors) and introduction to precision measuring instruments. Course includes reading a scale and protractor and taking linear and angular measurements. Converting English Standard to Metric is introduced using conversation tables. *Prerequisite:* Module 400, Lesson One: *Basic Math*.

Learning Objectives:

At the completion of this lesson, the student will be able to:

- Take linear measurements to an accuracy of $1/16^{\text{th}}$, $1/32^{\text{nd}}$ and $1/64^{\text{th}}$ of an inch using a common scale (rule)
- Define the parts of a circle (circumference, diameter and radius).
- Describe three types of angles (right, acute and oblique) and three types of triangles (right, isosceles and equilateral).
- Identify three precision measurement instruments (calipers, dial indicators and micrometers) and describe how each are used in metalforming.
- Identify and describe three different types of drawings (Pictorial, Isometric and Orthographic).
- Explain the difference between a controlled print versus a reference print.
- Identify and explain the Title Block.
- Match a part to a pictorial print / single view drawing.
- Identify common alphabet of lines used in engineering drawings.
- Sketch an orthographic projection from a three-dimensional pictorial drawing.
- Look at a simple part/print and measure linear distances to an accuracy of $1/64^{\text{th}}$ of an inch.
- Given a formed part that requires a 90° bend and a protractor, measure and determine if the form is 90° , overbent, or underbent.
- Convert fractions to decimal and metric equivalents using a conversion table

Methods of Instruction:

Lecture, spatial reasoning problems, measurement and math calculation problems, self-study reading and application demonstrations (individual and group) with real-world examples.

Methods of Evaluation:

Application exercises (*Skill Checks*) and written quizzes/exams (*PROficiency Practices and Assessment*) during and after training.

Lesson Materials Provided by PMA:

- ◆ *PMAEF Student Study Guide – Measurement & Engineering Drawings I*
 - ◆ *LS Starret Handouts*
 - ◆ Student handouts and problem exercises
 - ◆ Mock piece-parts and matching prints
 - ◆ *PMAEF 6” steel rule and protractor*
 - ◆ *PMAEF Instructor Guide with SMART Lesson Plans, Blueprint/Engineering Drawing Examples, Skill Checks, and PROFiciency Practices & Assessment*
 - ◆ Transparencies
 - ◆ *PMAEF Item Bank (assessment questions) for construction of end of lesson examination*
 - ◆ List of recommend student reading and study materials.
- ☞ Note: Student Study Guide, PMAEF handouts, transparencies and item bank provided on CD or disk.

Lesson Topics & Content Outline:

- ◆ **Measurements**
 - Types of Measurements (linear, angular and circular)
 - Measuring Length, Width, Height and Depth
 - English System and Metric System (conversion tables)
 - Measuring Circles (circumference, diameter and radius)
 - Measuring Angles.
 - ◆ **Measuring Tools**
 - Common Rule, Scales and Tape Measure
 - Introduction to Precision Measuring Instruments (calipers, dial indicators and micrometers)
 - Take Linear Measurements using a Steel Rule
 - Measure Angles (inside and outside) using a Protractor
 - Basic Care of Measuring Tools.
 - ◆ **Introduction to Blueprints and Engineering Drawings**
 - History, Formats & Sizes
 - Visualization and Spatial Reasoning
 - Shape Description (length, width, height and area)
 - Introduction to the Alphabet of Lines
 - Perspective and Scale
 - Types of Drawings and Prints.
 - Sketch
 - Pictorial - Oblique, Isometric and Perspective
 - Orthographic - Single, Two and Three View.
 - Angle of Projection (1st and 3rd angles)
 - Placement of Views, Sectional Views, Holes and Cutting Plane
 - Controlled Documents and Reference Drawings.
- ❖ **End of Module Lesson Exam (PROficiency Assessment)**

☞ Note: See SMART Lesson Plan contained in the Instructor’s Guide for content detail, flow of lesson and assessments (*PROficiency Practices and Skill Checks*).