
BME452- MANUFACTURING PROCESSES LAB

CO-1 : Students will be able to make the component using casting and finishing methods.

CO-2 : Students will be able to make the component using metal cutting / unconventional machining methods.

CO-3 : Students will be able to make the component using metal joining processes.

List of Experiments: (At least 8 of the following along-with study of the machines/processes)

1. Making of Pattern (Wax / Wooden)
 2. Preparation of Mould and Casting
 3. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
 4. Bolt (thread) making on Lathe machine.
 5. Tool grinding (to provide tool angles) on tool-grinder machine.
 6. Gear cutting on Milling machine.
 7. Finishing of a surface on surface-grinding machine.
 8. Drilling holes on drilling machine and study of twist-drill.
 9. Study of different types of tools and its angles & materials.
 10. Experiment on tool wear and tool life.
 11. Experiment on jigs/Fixtures and its uses.
 12. Gas welding experiment.
 13. Arc welding experiment.
 14. Resistance welding experiment.
 15. Soldering & Brazing experiment.
 16. Experiment on Unconventional Machining (any one among - Laser Cutting, CO2 Cutting, ECM, EDM etc.)
-
-
-
-

Manufacturing Processes Laboratory Manual

Experiment 1: Making of Pattern (Wax / Wooden)

Objective:

To study and prepare a pattern using wax or wood for casting process.

Apparatus:

Wood or wax material, cutting tools, measuring scale, file, sandpaper.

Theory:

A pattern is a replica of the object to be cast. It is used to prepare the mould cavity into which molten metal is poured.

Patterns are made slightly larger than the final casting to compensate for shrinkage.

Common Pattern Materials:

1. Wood
2. Wax
3. Plastic
4. Metal

Procedure:

1. Select suitable pattern material (wax or wood).
2. Mark dimensions according to drawing.
3. Cut the material to required shape.
4. Finish surfaces using file and sandpaper.
5. Check dimensions and finish.

Result:

A pattern of required shape and dimensions was successfully prepared.

Experiment 2: Preparation of Mould and Casting

Objective:

To prepare a sand mould and perform metal casting.

Apparatus:

Moulding box (flask), moulding sand, pattern, trowel, sprue pin, furnace.

Theory:

Casting is a manufacturing process in which molten metal is poured into a mould cavity and allowed to solidify.

Parts of Mould:

1. Cope (upper part)
2. Drag (lower part)
3. Sprue
4. Runner
5. Gate
6. Riser

Procedure:

1. Place pattern in drag box and fill moulding sand.
2. Ram the sand properly.
3. Place cope on drag and insert sprue pin.
4. Fill sand in cope and ram.
5. Remove pattern carefully to create mould cavity.
6. Pour molten metal into sprue.
7. Allow casting to solidify and remove it.

Result:

Sand mould was prepared and casting was successfully obtained.

Experiment 3: Tool Grinding on Tool-Grinder Machine

Objective:

To grind a cutting tool and provide required tool angles.

Apparatus:

Tool grinder machine, HSS tool blank, safety goggles.

Theory:

Tool grinding is done to provide proper tool geometry such as rake angle, clearance angle and cutting edge angle which affect cutting performance.

Common Tool Angles:

1. Rake angle
2. Clearance angle
3. Cutting edge angle
4. Nose radius

Procedure:

1. Switch on the tool grinding machine.
2. Hold tool blank firmly.
3. Grind side and end faces to required angles.
4. Cool tool in water frequently.
5. Check tool geometry.

Result:

The cutting tool was ground with required tool angles.

Experiment 4: Study of Different Types of Cutting Tools and Tool Materials

Objective:

To study different types of cutting tools and tool materials used in machining.

Theory:

Cutting tools are used to remove material from the workpiece during machining.

Types of Cutting Tools:

1. Single point cutting tool
2. Multi point cutting tool
3. Milling cutter
4. Drill

Tool Materials:

1. High Speed Steel (HSS)
2. Carbide
3. Ceramic
4. Diamond tools

Important Tool Angles:

1. Rake angle
2. Clearance angle
3. Wedge angle

Result:

Different cutting tools and tool materials were studied.

Experiment 5: Tool Wear and Tool Life

Objective:

To study tool wear and determine tool life during machining.

Theory:

Tool wear occurs due to friction and high temperature during cutting.

Types of Tool Wear:

1. Flank wear
2. Crater wear
3. Nose wear

Tool Life:

Tool life is defined as the time during which the tool performs satisfactorily.

Taylor Tool Life Equation:

$$V T^n = C$$

Where

V = Cutting speed

T = Tool life

n and C are constants

Procedure:

1. Perform machining operation on workpiece.
2. Measure tool wear after regular intervals.
3. Record tool life.
4. Plot graph between cutting speed and tool life.

Result:

Tool wear pattern and tool life were studied.