

LABORATORY MANUAL

W-SHOP TECHNOLOGY LAB

ME-105-F

ME-105F : WORKSHOP TECHNOLOGY

MAHARISHI DAYANAND UNIVERSITY ROHTAK SYLLABUS B.TECH.
FIRST YEAR

LIST OF EXPERIMENTS

S.No.	NAME OF EXPERIMENTS	PAGE No.	
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1.	To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.	01	01
2.	To study different types of machine tools (lathe, shaper or planer or slotter, milling, drilling machines).	02	02
3.	To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.	03	03
4.	To study different types of fitting tools and marking tools used in fitting practice.		
5.	To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.	04	04
6.	To prepare joints for welding suitable for butt welding and lap welding.	05	05
7.	To perform pipe welding.		
8.	To study various types of carpentry tools and prepare simple types of at least two wooden joints.	06	07
9.	To prepare simple engineering components/ shapes by forging.	08	08
10.	To prepare mold and core assembly, to put metal in the mold and fettle the casting.	09	10
11.	To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/planner.	11	11
12.	To prepare a job involving side and face milling on a milling machine.	12	12

Notes :

- (i) At least 10 experiments are to be performed by students in the semester.
- (ii) At least 7 experiments should be performed from the above list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

PRACTICAL-1

Aim:- To study different types of measuring tools used in metrology and determine least counts of vernier calipers, micrometers and vernier height gauges.

Procedure:- Describe in brief the following measuring tools with neat sketch mentioning their sizes & usage.

- 1) Vernier caliper
- 2) Micrometer (inside & outside)
- 3) Vernier height gauge
- 4) Vernier depth gauge
- 5) Standard wire gauge
- 6) Combination set
- 7) Screw thread gauge
- 8) Depth micrometer
- 9) Radius gauge
- 10) Caliper
- 11) Try square
- 12) Sine bar
- 13) Bevel protector
- 14) Dial indicator

Least count:- Least count of vernier caliper, micrometer, & vernier height gauge to be calculated.

Precautions:-

- 1) Measuring tools should not be mishandled.
- 2) Proper upkeep of measuring tool is necessary must be cleaned.
- 3) Tools before & after use kept in store
- 4) Tools should be calibrated after certain interval & accuracy determined.

PRACTICAL-2

Aim:- To study different types of machine tools (lathe, shaper or planer or slotter, milling, drilling machines).

Procedure:-

- 1) Neat diagram of following machine tools to be drawn.
- 2) Brief description of the machine tools to be given.
- 3) Important parts to be labeled & marked.
- 4) Accessories should be indicated.
- 5) Different function of the machine tool can perform to be described.

Machine tools:-

- 1) Different types of lathe.
- 2) Different types of drilling machine.
- 3) Different types of milling machine e.g. horizontal, vertical, universal.
- 4) Shaper
- 5) Planer
- 6) Slotter

Precautions:-

How various operations can be performed on a particular machine tool and the precautions required for that to be remembered.

Upkeep & usual maintenance of the machine tools must be well understood.

PRACTICAL -3

Aim: - To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.

Tool required:- Single point cutting tool, radius tool, parting tool.

Material required:- Mild steel rod.

Instruments required:- Steel rule, vernier caliper, out side caliper, sine bar.

Procedure:-

1. Job is fixed in three jaw chuck for proper alignment.
2. Single point cutting tool is fixed in the tool post and facing operation is completed.
3. A rough cut is used to turn the outer periphery.
4. Final turning and step turning operation are completed in sequence.
5. The compound slide is set at the taper angle as per calculation with the center line and tapering operation is completed through different cuts.
6. Radius tool is fixed in tool post for making radius and the operation is completed.
7. For maintaining the proper length of the job parting off tool is used and parting operation is completed.

Precautions:-

Work piece should be firmly gripped in the three jaw chuck.

Coolant is to be used.

Hand gloves and apron must be used while working.

Proper rpm should be selected before the operation.

PRACTICAL – 5

Aim: - To prepare lay out on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.

Material Required: - G.I. (galvanized iron) sheet 26 SWG.

Tool Required:- Scale, scribe, snip, bench shearing machine, mallet, surface plate, rail line, pipe stake, combination plier, bench vice, funnel stake, setting hammer, Ball peen hammer.

Procedure for Tray making:-

- (2) Sheet of required size is cut and smoothed by using mallet.
- (3) Layout of the tray is drawn on the sheet as per pattern using the scribe.
- (4) Four corners are cut as per marking using straight snip.
- (5) Edges are folded to make the beading on all four sides.
- (6) Bending of all four sides are done at right angles opposite the beading and bend corners using mallet.
- (7) Then the tray is finished.

Procedure for Pipe making:-

- (1) The sheet of required size is cut and marked for lock grooved joint.
- (2) Edges are folded for joint.
- (3) Bending of the piece is done using pipe stake and mallet.
- (4) The job is finished using mallet, combination plier and setting hammer.

Precautions:-

Be careful and attentive while working on metal sheet.
Wear, apron, shoes, gloves and tight fitted clothes.
Use proper tools for each operation.

PRACTICAL: - 6

Aim: - To prepare joints for welding suitable for butt welding and lap welding.

Tool required: - Scale, scribe, hand hack saw, flat file, swing scale protector, welding machine, eye shield, gloves, wire brush, chipping hammer, welding rod.

Material required: - Mild steel plate of 8mm thickness.

Procedure for Butt Joint:-

1. Two pieces are cut to size and surfaces are cleaned.
2. One edge of both the pieces is prepared at 45 degree angle for making V-groove using file.
3. Electrode is held in electrode holder and earth clamp is clamped to the work piece.
4. Pieces are positioned properly butting each other and tack weld is done at two end points.
5. 2-3 mm spark gap is maintained and continuous welding is done slowly.
6. Slag is removed using chipping hammer and the weld is cleaned using wire brush.

Procedure for Lap Joint:-

1. Two pieces are cut to size and surfaces to be welded are cleaned properly.
2. Electrode is held in electrode holder and earth clamp is clamped to be work piece.
3. The pieces are positioned overlapping each other for lap joint and tack weld is done at two end points.
4. 2-3 mm spark gap is maintained and welding is done smoothly.
5. Slag is removed using chipping hammer and weld is cleaned using wire brush.

Precautions:-

Wear apron, shoes, nose mask, gloves and tight fitted clothes.

Be careful and attentive while working on welding job.

During welding don't see the welding light directly without the goggles / face shield.

Do not cool the welding piece in water.

Do not keep electrode holder on the welding machine.

No inflammable material should be present in welding shop.

PRACTICAL – 8

Aim: - To study various types of carpentry tools and prepare simple types of at least two wooden joints.

Carpentry tools: - Proper use of following carpentry tools should be understood well.

Measuring and marking tools:- Steel scale, try square, bevel square, marking gauge.

Cutting tools: - Cross cut saw, tenon saw, key hole saw, compass saw, firmer chisel, dove tail chisel, mortise chisel, adze, rasp.

Boring tools: - Auger, gimlet.

Planning tools: - Wooden jack plane, metal jack plane.

Striking tools: - Claw hammer cross peen hammer and mallet.

Holding and supporting tools: - Bench vice, carpentry vice, C-clamp.

CROSS LAP JOINT

Material required: - Two wooden pieces of required dimensions.

Tools required: - Steel scale, try square, cross cut saw, rasp, firmer chisel, and hummers.

Procedure:-

- (1) Two wooden pieces of required size are to be cut.
- (2) The pieces are squared using jack plane and rasp.
- (3) Length, width and height for lap joint are marked on both the pieces.
- (4) One piece is clamped in vice and unwanted material is removed as per marking, using saw, firmer chisel and hummer and the piece is finished using rasp file.
- (5) The process is repeated on the second piece.
- (6) The piece should be fitted with normal hand pressure.

MORTISE/ TENON JOINT

Material required: - Two wooden pieces of required dimension

Tools required: - Steel scale, try square, cross cut saw, rasp, firmer chisel, mortise and tenon chisel and hammers.

Procedure:-

- (1) Two wooden piece of required size are to be cut.
- (2) The pieces are Squared using jackplane and rasp.
- (3) One piece is marked for mortise rectangular hole.
- (4) Another piece is marked for tenon T shape.
- (5) The mortise hole is made using mortise and dove tail chisel.
- (6) The tenon T- shape is made using saw.
- (7) Both the pieces are finished using rasp.
- (8) Both pieces should be fitted with normal hand pressure.

Precautions:-

Wear apron, shoes, gloves and tight fitted clothes.

Be careful and attentive while working on carpentry job.

Use proper tools for each operation.

Don,t keep any sharp tool in your pocket.

While using chisel cutting should be in direction away from yours body.

Tools being used should be well sharpened.

PRACTICAL: - 9

Aim: - To prepare simple engineering components/ shapes by forging.

Material required:- M.S. rod of diameter 8 mm, for making ring.
M.S. square 16×16 mm for chisel.

Tools required: - Steele scale, scribe, hand saw, cross cut file, furnace, hammer, anvil, flat tong, and swage block.

Procedure for Chisel:-

1. M.S. square of required length is to be cut.
2. One end of the piece is heated in furnace to red hot condition.
3. Hot piece is brought to anvil holding by a tong.
4. The piece is shaped using smith hammer.
5. If required the piece is reheated and the process is repeated.
6. The piece is put in to water for tempering.

Procedure for Ring:-

1. M.S rod of required length to be cut.
2. The piece is heated in furnace to red hot conditions.
3. Hot piece is held with a tong and brought to anvil.
4. The piece is shaped on horn anvil using hammer.
5. If required the piece is re heated and the process is repeated.
6. Complete round is made on swage block.
7. The piece is put in to the water for tempering.

Precautions:-

Wear `apron, shoes, nose mask, gloves and tight fitted clothes.
Be careful and attentive while working on job of forging.
Hammering should be done only when the work piece is hot.
Always use appropriate tongs and tools.

PRACTICAL: - 10

Aim:- To prepare mold and core assembly, to put metal in the mold and fettle the casting.

Material required:-

Green sand mould		
River sand	-	70%
Clay sand	-	10%
Molasses	-	5%
Water	-	8-10%
Additives		
Coal dust	-	2-5%
Saw dust	-	2%
Silica sand	-	2%

Tools required:-

Moulding flask (cope and drag), shovel, hand riddle, vent wire, trowel, lifter, gate cutter, strike off bar, runner and riser, sprue pin, slicks, rammer, swab, crucible furnace, tong.

Procedure:-

1. A mould box suitable for the pattern should be selected.
2. Lower part of the pattern is placed in the middle of drag.
3. Drag is filled with the moulding sand and rammed properly.
4. Parting sand is sprinkled over the top surface of the mould.
5. The cope is placed over the drag in proper position.
6. Then the top part of the drag in proper position.
7. Runner and riser are placed in position and the cope is filled with sand and rammed.
8. Then the cope is separated from drag and the pattern is removed.

9. The gate is made using gate cutter and the mold cavity is repaired for small damage.
10. The core is placed in position and located.
11. The mould is allowed drying.
12. The mould is ready for pouring.
13. Metal is melted in crucible to correct temperature.
14. The crucible is held with a tong and the metal is poured in the mould and allowed to solidify and cool.
15. After cooling the casting is extracted breaking the mould.
16. Gates and riser are cut off.
17. The entire surface is cleaned using wire brush.

Precautions:-

Wear apron, shoes, gloves and tight fitted clothes.
Be careful and attentive while working on hot metal.
Runner and riser should be placed at the right place.
Sand should be mixed properly.

PRACTICAL: - 11

Aim: - To prepare horizontal surface/ vertical surface/ curved surface/ slots or V-grooves on a shaper/planner.

Tool required: - Tool holder, shaping tool, centre punch, hammer.

Material required: - Mild steel work piece.

Instrument required: - Steel rule, vernier caliper, vernier height gauge, depth gauge, try square

Procedure:-

1. Work piece of required dimension to be cut on power hack saw.
2. The job is fixed in vice of shaper machine.
3. Top surface is machined first.
4. The Job surface is inverted and clamped tightly in the vice.
5. All the remaining surfaces are machined in sequence.
6. Then marking is done as per the drawing for making groove.
7. The groove is machined using round nose cutting tool.
8. For making the groove feed to the table and tool is given simultaneously.
9. The groove is shaped in different cuts to achieve the desired depth.

Precautions:-

Work piece should be firmly gripped in the vice.

Adjust the stock length as per job.

Do not over speed or over cut the machine during operation.

Hand gloves apron and shoes must be used while working.

PRACTICAL: - 12

Aim: - To prepare a job involving side and face milling on a milling machine.

Tool required: - Side and face milling cutter.

Material required: - Mild steel work piece.

Instrument required: - Steel rule, vernier caliper depth gauge, vernier height gauge try square and scriber.

Procedure:-

1. Work piece of metal as per required dimension is cut on power hacksaw.
2. Required dimension is marked on the work piece using try square and scriber.
3. Side and face milling cutter is fixed in the arbor appropriately.
4. The job is Fixed in vice of milling machine.
5. The side milling from all four sides of the job is done using small cuts till marking is achieved.
6. The piece is marked for maintaining the height.
7. The top surface is milled till the required height is achieved.

Precautions:-

Work piece should be firmly gripped in the vice.

Coolant is to used.

Don't try to over speed the machine should be at slow speed.

Hand gloves, apron and shoes must be used while working.