## DEPARTMENT OF MECHANICAL ENGINEERING

| NAME OF THE LAB | MANUFACTURING TECHNOLOGY LAB-II |
|---|---|
| PURPOSE | The Aim of The Subject Is To Make Students Understand The Basic Manufacturing Operation in various machines |

# STANDARD OPERATING PROCEDURE

## HEAVY DUTY LATHE MACHINE

### CONTROL PLAN:

- Read and become familiar with machine's operating procedures before operating
- Always know where the power off switch is located in case of emergency
- Always turn switch to off position when not operating machine
- Always disconnect the machine from the power source before servicing, repairing, or making any adjustments
- Wear safety glasses at all times while operating the lathe to protect eyes from any dust or debris
- Wear a dust or face mask to prevent the inhalation of dust from operating the machine
- Do not wear gloves, necktie, jewelry, or loose clothing, as they could get caught in the rotating elements of the machine
- Tie up long hair or wear protective hair covering to prevent hair from getting caught in the rotating elements of the machine
- Always clamp work piece. Never operate on loose work. Never secure the work piece with your hands.
- Always use guards in the appropriate position when operating the lathe.
- Always use recommended speed and specifications for lathe and accessories

### EXPERIMENTAL PROCEDURES:

- Put on all safety equipment and tie back loose hair or clothing before operating machine Check to make sure all parts of machine are working and functioning properly
- Double check all measurements for operating machine on work piece
- Adjust machine to correct speed for machining process
- Put work piece into chuck
- Use chuck key to loosen and tighten the chuck
- Remove chuck key from chuck and place out of chuck path of rotation
- Make sure all safety equipment is on correctly and put safety guards into position
- Start machine by turning black knob into on position
- During operation, keep hands a safe distance away and only use adjustment tools on lathe to maneuver work piece.
- When finished, turn off the lathe right away
- Wait until rotating chuck has completely stopped before handling work piece
- Clean machine after use and dispose of debris (see Waste Management Procedures)

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# STANDARD OPERATING PROCEDURE

## DRILLING MACHINE

**CONTROL PLAN:**

- Know the location of start and stop switches or buttons and keep the drill and other materials.
- Use only properly sharpened drill bits, sockets and chucks in good condition. Remove dull drill bits, battered tangs, or sockets from service.
- Use brushes or other tools to properly remove chips.
- Do not attempt to oil the machine or make adjustments to the work while the drill press is in motion.
- Do not insert a drill chuck key into the chuck until the power is shut off and the machine has come to a complete stop.
- All belts and pulleys must be guarded; if frayed belts or pulleys are observed, the drill press must be taken out of service and the belts or pulleys must be replaced.
- All stock must be properly secured with a vise or clamps prior to a machining process.
- If the stock slips in the vise or clamp, the operator must not attempt to hold the work with his/her hand or try to tighten the vise/clamp while the machine is in motion. Shutdown the power to the machine prior to re-tightening the loose stock.
- Use the correct speed and drill for the type of stock being machined.
- The drill bit should be mounted the full depth and in the center of the chuck.
- Position the table and adjust the feed stroke eliminating the possibility of the bit striking the table.
- Feed the bit smoothly into the work. If the hole being drilled is deep, withdraw the bit frequently to remove shaving on the bit.
- Never attempt to remove a broken drill with a center punch or hammer.

**EXPERIMENTAL PROCEDURES:**

- The given work piece is first fitted to get required length, breadth and thickness wet chalk is applied on four sides and with the scriber lines are drawn to get centre hole at required location.
- The centers are punched with a Punch and hammer.
- The work piece is fixed firmly in the vice of the Drilling Machine
- 3/8” drill bit is fixed firmly in the chuck and drilling is performed giving uniform depths.
- The drill bit is removed from the drill chuck and is replaced by a reamer.
- The reaming operation is performed on the hole which has been previously drilled.
- The work is removed from the vice for performing tapping operation.
- The job is fixed firmly in a bench vice.
- Tap is fixed in the tap handle and pressure applied on the taps to obtain internal thread.

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# STANDARD OPERATING PROCEDURE

## SHAPING MACHINE

### CONTROL PLAN:

1. Safety glasses must be worn at all times in work areas.
2. Always know where the power off switch is located in case of emergency
3. Always turn switch to off position when not operating machine.
4. Appropriate footwear with substantial uppers must be worn.
5. No Long and loose hair must be contained.
6. Switch off the machine when work completed.
7. Before making adjustments and measurements or before cleaning swarf accumulations, switch off and bring the machine to a complete standstill.
8. Leave the machine and work area in a safe, clean and tidy state.
9. Keep clear of moving machine parts.
10. Follow correct clamping procedures. Keep overhangs as small as possible and check work piece is secure.
11. Ensure you have selected correct speed and rate.
12. Ensure you have set the correct depth of cut.

### EXPERIMENTAL PROCEDURES:

1. The given raw material rectangular block is measured. The machining allowances are noted. Then the job is coated with white chalk for marking purpose.
2. The job is position in the marking table. The vernier height gauge is set to the correct dimensions as per the part drawing dimensions
3. After, the height -- mm is corrected in the vernier height gauge; the vernier scriber is marked in the face sides of the rectangular block.
4. To identify the dimensions of the job, the marking lines are punched
5. The work piece is placed in the shaping machine work holding device in correct position. Tool is held in the head in suitable position.
6. The stroke length and initial cutting position are corrected by adjusting the ram and table manually
7. The tool is held in the tool post in vertical position
8. Now, the machine is switched ON. The tool moves over the work, the materials is removed from the work by the tool cutting force.
9. By giving cross-feed movement to the table, the total length of work is machined, after completion of one cut, the depth of cut is adjusted in the tool head. Then the next cut is taken.
10. By repeating the above same procedure, the other faces are machined to the required dimensions

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# STANDARD OPERATING PROCEDURE

## MILLING MACHINE

**Control Plan:**

1. Always know where the power off button is located in case of emergency
2. Always disconnect the machine from the power source before making any repair, adjustment, or when installing or removing tooling
3. Do not wear gloves, loose sleeves, jewelry, or unrestrained hair styles as they could get caught in the rotating elements of the machine
4. Wear safety glasses to protect the eyes from chips
5. Always keep the belt assembly enclosed when running, to prevent in-running nip points from causing injury.
6. Always secure work to mill table. Never mill loose work. Never secure the work with hands.
7. Always check validate spindle speed with the endmill size and type of material before beginning the milling process

**Experimental Procedures:**

1. Put on all safety equipment and tie back loose hair or clothing before operating machine.
2. Check to make sure all parts of machine are working and functioning properly.
3. Double check all measurements for operating machine on work piece.
4. Position work piece as desired and clamp to table.
5. Make sure all safety equipment is on correctly and put safety guards into position.
6. Start machine by pressing the on button.
7. Use machine to mill work piece as desired.
8. When finished, turn off milling machine right away.
9. Wait until spindle has completely stopped before unclamping work piece.
10. Clean machine after use and dispose of debris.

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# STANDARD OPERATING PROCEDURE

### SURFACE GRINDING MACHINE

**CONTROL PLAN:**

- Read and become familiar with machine's operating procedures before operating
- Always know where the power off switch is located in case of emergency
- Always turn switch to off position when not operating machine
- Always disconnect the machine from the power source before servicing, repairing, or making any adjustments
- Wear safety glasses at all times while operating the lathe to protect eyes from any dust or debris
- Wear a dust or face mask to prevent the inhalation of dust from operating the machine
- Do not wear gloves, necktie, jewelry, or loose clothing, as they could get caught in the rotating elements of the machine
- Tie up long hair or wear protective hair covering to prevent hair from getting caught in the rotating elements of the machine
- Always clamp work piece. Never operate on loose work. Never secure the work piece with your hands.
- Remove work piece from grinding wheel before turning machine off.

**EXPERIMENTAL PROCEDURE**

1. Ensure the proper wheel for the stock is being used. There are different grinding wheels for aluminum, stainless steel, and titanium.
2. Clean the bed before placing the work piece onto it. This will prevent interference with the magnetic chuck.
3. Turn the magnetic chuck on to secure the pieces onto the bed.
4. Adjust the bed and saddle position to center the stock below the wheel.
5. Lower the wheel an inch above the work piece.
6. Lock the table longitudinal stroke setting block so that there is about an inch of over travel at each end of the table stroke.
7. Adjust the table position so the wheel sits about an inch to the right of the work piece.
8. Ensure the wheel is not in contact with the work piece before turning the main power on. Press the green button to turn the spindle on and turn the coolant switch on.
9. Grind the stock by making passes left to right along the x-axis.
10. Once the first strip of the work piece has been sufficiently ground, turn the y-axis hand wheel half a turn clockwise.
11. Grind another strip of the work piece from left to right along the x-axis.
12. Repeat until the work piece is fully ground, then repeat all of the previous steps for the other side.

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# STANDARD OPERATING PROCEDURE

## BENCH GRINDING MACHINE

**Control Plan:**

- Read and become familiar with machine's operating procedures before operating
- Always know where the power off switch is located in case of emergency
- Always turn switch to off position when not operating machine
- Always disconnect the machine from the power source before servicing, repairing, or making any adjustments
- Wear safety glasses at all times while operating the lathe to protect eyes from any dust or debris
- Wear a dust or face mask to prevent the inhalation of dust from operating the machine
- Do not wear gloves, necktie, jewelry, or loose clothing, as they could get caught in the rotating elements of the machine
- Tie up long hair or wear protective hair covering to prevent hair from getting caught in the rotating elements of the machine
- Always clamp work piece. Never operate on loose work. Never secure the work piece with your hands.
- Remove work piece from grinding wheel before turning machine off.

**Experimental Procedure**

1. Ensure the proper wheel for the stock is being used. There are different grinding wheels for aluminum, stainless steel, and titanium.
2. Adjust the bed and saddle position to center the stock below the wheel.
3. Lower the wheel an inch above the work piece.
4. Lock the table longitudinal stroke setting block so that there is about an inch of over travel at each end of the table stroke.
5. Grind another strip of the work piece from left to right along the x-axis.
6. Repeat until the work piece is fully ground, then repeat all of the previous steps for the other side.

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# STANDARD OPERATING PROCEDURE

## SLOTTING MACHINE

**CONTROL PLAN:**

- Read and become familiar with machine's operating procedures before operating
- Always know where the power off switch is located in case of emergency
- Always turn switch to off position when not operating machine
- Always disconnect the machine from the power source before servicing, repairing, or making any adjustments
- Wear safety glasses at all times while operating the lathe to protect eyes from any dust or debris
- Wear a dust or face mask to prevent the inhalation of dust from operating the machine
- Do not wear gloves, necktie, jewelry, or loose clothing, as they could get caught in the rotating elements of the machine
- Tie up long hair or wear protective hair covering to prevent hair from getting caught in the rotating elements of the machine
- Always clamp work piece. Never operate on loose work. Never secure the work piece with your hands.
- Remove work piece from grinding wheel before turning machine off.

**EXPERIMENTAL PROCEDURE**

1. The tool is fixed to the tool post such that the movement should be exactly perpendicular to the table.
2. The work piece is then set in the vice such that the tool is just above the work piece. Adjust the length of the stroke of the ram.
3. Slotting operation is performed and makes one slot on the work piece to the required dimensions.
4. Then bring the tool to the initial position.
5. Rotate the work table by an angle 90o and continue the process for the second slot.
6. Repeat the process for the remaining slots.

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# STANDARD OPERATING PROCEDURE

## PLANNING MACHINE

**CONTROL PLAN:**

- Read and become familiar with machine's operating procedures before operating
- Always know where the power off switch is located in case of emergency
- Always turn switch to off position when not operating machine
- Always disconnect the machine from the power source before servicing, repairing, or making any adjustments
- Wear safety glasses at all times while operating the lathe to protect eyes from any dust or debris
- Wear a dust or face mask to prevent the inhalation of dust from operating the machine
- Do not wear gloves, necktie, jewelry, or loose clothing, as they could get caught in the rotating elements of the machine
- Tie up long hair or wear protective hair covering to prevent hair from getting caught in the rotating elements of the machine
- Always clamp work piece. Never operate on loose work. Never secure the work piece with your hands.
- Remove work piece from grinding wheel before turning machine off.

**EXPERIMENTAL PROCEDURE**

1. Put on all safety equipment and tie back loose hair or clothing before operating machine Check to make sure all parts of machine are working and functioning properly
2. Double check all measurements for operating machine on work piece
3. Adjust machine to correct speed for machining process
4. Put work piece into table
5. Use key to loosen and tighten the work piece.
6. Remove chuck key from chuck and place out
7. Make sure all safety equipment is on correctly and put safety guards into position.

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