



**DEPARTMENT OF MECHANICAL ENGINEERING**  
**17CMES81-ENGINEERING SKILLS PRACTICE LAB (UG)**  
**STANDARD OPERATING PROCEDURE**

|                           |  |
|---------------------------|--|
| Name of the Lab./facility | Engineering Skills Practice Lab  |
| Purpose                   | To provide training for students, about metal cutting practices.             |
| Scope                     | To understand the concept of metal cutting and how to cut metal in easy way. |
| Responsibility            | Faculty Incharge, HOD/MECH   |

**STANDARD OPERATING PROCEDURE FOR FITTING VICE**

- The dimensions of the given piece are checked with the steel rule.
- The job is fixed rigidly in a bench vice and the two adjacent sides are filed, using the rough flat file first and then the smooth flat file such that, the two sides are at right angle.
- The right angle of the two adjacent sides is checked with the try square.
- Chalk is then applied on the surface of the work piece.
- The given dimensions are marked by scribing two lines, with reference to the above two datum sides by using Vernier height gauge, Angle plate and Surface plate.
- Using the dot punch, dots are punched along the above scribed lines.
- The two sides are then filed, by fitting the job in the bench vice; followed by checking the flatness of the surfaces.
- As the material removal through filing is relatively less, filing is done instead of sawing.

**PRECAUTIONS TO BE FOLLOWED**

- Keep hands and tools wiped clean and free of dirt, oil and grease. Dry tools are safer to use than slippery tools.
- Do not carry sharp tools on pockets.
- Wear leather shoes and not sandals.
- Apply force only on the forward (cutting) stroke and relieve the force on the return stroke while sawing and filing.
- Do not hold the work piece in hand while cutting.
- Use the file with a properly fitted tight handle.
- After filing, remove the burrs from the edges of the work, to prevent cuts to the fingers.
- Do not use vice as an anvil. While sawing, keep the blade straight; otherwise it will break
- Do not use a file without handle.
- Clean the vice after use.

**RECORD TO BE MAINTAINED**

- Laboratory Manual containing the experiments that can be performed with the equipment
- Maintenance Record

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**HOD/MECH**



**AVIT**  
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY



VINAYAKA MISSION'S  
RESEARCH FOUNDATION  
(Deemed to be University under section 3 of the UGC Act 1956)



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|---------------------------|---|
| Name of the Lab./facility | Engineering Skills Practice Lab   |
| Purpose                   | To provide training for students, about Carpentry the process of making wooden components. preparation of joints is one of the important operations in all woodworks. |
| Scope                     | It deals with the specific work of carpenter like making different types of joints to form a finished product.  |
| Responsibility            | Faculty Incharge, HOD/MECH  |

**STANDARD OPERATING PROCEDURE FOR CARPENTRY VICE**

- The given reaper is checked to ensure its correct size.
- The reaper is firmly clamped in the carpenter's vice and any two adjacent faces are planed by the jack plane and the two faces are checked for squareness with the try square.
- Marking gauge is set and lines are drawn at 30 and 45 mm, to mark the thickness and width of the model respectively.
- The excess material is first chiseled out with firmer chisel and then planed to correct size.
- The mating dimensions of the parts X and Y are then marked using scale and marking gauge
- Using the crosscut saw, the portions to be removed are cut in both the pieces, followed by chiseling and also the parts X and Y are separated by crosscutting, using the tenon saw.
- The ends of both the parts are chiseled to the exact lengths.
- A fine finishing is given to the parts, if required so that, proper fitting is obtained.
- The parts are fitted to obtain a slightly tight joint.

**PRECAUTIONS TO BE FOLLOWED**

- Tools that are not being used should always be kept at their proper places.
- Make sure that your hands are not in front of sharp edged tools while you are using them.
- Use only sharp tools. A dull tool requires excessive pressure, causing the tool to slip.
- Wooden pieces with nails, should never be allowed to remain on the floor.
- Be careful when you are using your thumb as a guide in cross cutting and ripping.
- Test the sharpness of the cutting edge of chisel on wood or paper, but not on your hand.
- Never chisel towards any part of the body.
- Do not use chisels where nails are present. Do not use chisel as a screw driver.
- Do not use a saw with a loose handle.
- Always use triangular file for sharpening the teeth.
- Do not use a saw on metallic substances.
- Do not use mallet to strike nails.
- Do not use plane at the places, where a nail is driven in the wood.

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|                           |   |
|---------------------------|---|
| Name of the Lab./facility | Engineering Skills Practice Lab   |
| Purpose                   | To provide training for students, about welding was mainly used for repairing all kinds of worn or damaged parts.   |
| Scope                     | Now, it is extensively used in manufacturing industry, construction industry (construction of ships, tanks, locomotives and automobiles) and maintenance work, replacing riveting and bolting, to a greater extent. |
| Responsibility            | Faculty Incharge, HOD/MECH  |

**STANDARD OPERATING PROCEDURE FOR WELDING**

- Take the two mild steel pieces of given dimensions and clean the surfaces thoroughly from rust, dust particles, oil and grease.
- Remove the sharp corners and burrs by filing or grinding.
- One edge of each piece is beveled, to an angle 30°.
- The two pieces are positioned on the welding table such that, they are separated slightly for better penetration of the weld.
- The electrode is fitted in to the electrode holder and the welding current is set to a proper value.
- The ground clamp is fastened to the welding table. The machine is switched ON
- Wearing the apron, hand gloves, using the face shield, the arc is struck and the work pieces are tack- welded at the ends and holding the two pieces together; first run of the weld is done to fill the root gap.
- Second run of the welding is done with proper weaving and with uniform movement. During the process of welding, the electrode is kept at angle of 15° to 25° from vertical and in the direction of welding.
- The slag formation on the weld is removed by chipping hammer.
- Filing is done to remove spatters around the weld.

**PRECAUTIONS TO BE FOLLOWED**

- Do not weld around combustible or inflammable materials, where sparks may cause a fire.
- Never weld containers, which have been used for storing gasoline, oil or similar materials, without first having them thoroughly cleaned.
- Check the welding machine to make sure that it is properly grounded and that all leads properly insulated.
- Never look at the arc with the naked eye. The arc can burn your eyes severely. Always use a face shield while welding.
- Prevent welding cables from coming in contact with hot metal, water, oil, or grease. Avoid dragging the cables around sharp corners.
- Ensure proper insulation of the cables and check for openings.

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- Always wear the safety hand gloves, apron and leather shoes.
- Always turn off the machine when leaving the work.
- Apply eye drops after welding is over for the day, to relieve the strain on the eyes.
- While welding, stand on dry footing and keep the body insulated from the electrode, any other parts of the electrode holder and the work.

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|                           |   |
|---------------------------|---|
| Name of the Lab./facility | Engineering Skills Practice Lab   |
| Purpose                   | To provide training for students, about foundry was mainly used for preparation of molds and casts.   |
| Scope                     | Now, it is extensively used in manufacturing industry, construction industry (construction of ships, tanks, locomotives and automobiles) and maintenance work, replacing riveting and bolting, to a greater extent. |
| Responsibility            | Faculty Incharge, HOD/MECH  |

**STANDARD OPERATING PROCEDURE FOR FOUNDRY**

- Place the pattern on the moulding board, with its flat side on the board.
- Place the drag over the board, after giving a clay wash inside.
- Sprinkle the pattern and moulding board, with parting sand.
- Allow loose sand, preferably through a riddle over the pattern, until it is covered to a depth of 2 to 3 cm.
- Pack the moulding sand around the pattern and into the corners of the flask, with fingers.
- Place some more sand in the flask and pack the pattern with a rammer, using first the peen end and then butt end.
- Strike-off the excess sand from the top surface of the drag with the strike-off bar.
- Turn the drag upside down.
- Blow-off the loose sand particles with the bellows and smoothen the upper surface.
- Place the cope on to the drag in position. Locate riser pin on the highest point of the pattern.
- Place the sprue pin at about 5 to 6 cm from the pattern on the other side of the riser pin.
- Sprinkle the upper surface with parting sand.
- Repeat steps 3 to 7, approximately.
- Make holes with the vent rod to about 1 cm from the pattern.
- Remove the sprue and riser pins by carefully drawing them out. Funnel shaped hole is made at the top of the sprue hole, called the pouring cup.
- Lift the cope and place it aside on its edge.
- Insert the draw pin into the pattern. Wet the edges around the pattern. Loosen the pattern by rapping. Then draw the pattern straight up.
- Adjust and repair the mould by adding bits of sand, if necessary.
- Cut gate in the drag from the sprue to the mould. Blow off any loose sand particles in the mould.
- Close the mould by replacing the cope and placing weights on it.

**PRECAUTIONS TO BE FOLLOWED**

- Do not get the sand too wet. Water is an enemy of molten metals.
- Provide adequate ventilation to remove smoke and fumes.
- Never stand near or look over the mould during the pouring because of the molten metal might be too hot.
- Do not shake out a casting too hastily, which may result in second and third degree burns.

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|--|---|
| Name of the Lab./facility  | Engineering Skills Practice Lab   |
| Purpose  | To provide training for students, about black smithy was mainly used for producing small articles for which accuracy in size is not so important. |
| Scope  | It is commonly employed for production of small articles using hammers on heated jobs.  |
| Responsibility   | Faculty Incharge, HOD/MECH  |
| <p align="center"><b>STANDARD OPERATING PROCEDURE FOR BLACK SMITHY</b></p> <ul style="list-style-type: none"> <li>• Take the raw material from stock i.e., mild steel 10 mm round shaped, cut the length of 50 mm.</li> <li>• Handle specimen with round tong and heat in blacksmith's forge up to the part appears as red cherry color code.</li> <li>• The required piece heated up to it gets the recrystallization temperature.</li> <li>• The part is taken out from the forge and blow with sledge hammer for obtaining the square shape on all edges.</li> <li>• The hammering is done on the anvil.</li> <li>• The above mentioned all steps are done, after the specimen bent in required shape.</li> <li>• Check the dimensions after cooling the job by quenching process.</li> </ul> <p><b>PRECAUTIONS TO BE FOLLOWED</b></p> <ul style="list-style-type: none"> <li>• Hold the job carefully while heating and hammering.</li> <li>• Job must be held parallel to the face of the anvil.</li> <li>• Wear steel-toed shoes.</li> <li>• Wear gloves when handling hot metal.</li> <li>• Wear face shield when hammering the hot metal.</li> <li>• Use correct size and type of tongs to fit the work.</li> <li>• Ensure that hammers are fitted with tight and wedged handles.</li> </ul> |   |
| <p align="right"> <br/> <b>HOD/MECH</b> </p>  |   |





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| Name of the Lab./facility | Engineering Skills Practice Lab   |
| Purpose                   | To provide training for students, about sheet metal was mainly used for its own significance in the engineering work. |
| Scope                     | It fulfill the household needs, decoration work and various engineering articles, are produced from sheet metals.     |
| Responsibility            | Faculty Incharge, HOD/MECH  |

**STANDARD OPERATING PROCEDURE FOR SHEET METAL**

- Take the raw material from stock i.e., mild steel 10 mm round shaped, cut the length of 50 mm.
- Mark the measurement and make the development surface sketch diagram.
- The layout of the tray is marked on given sheet.
- The layout of the tray is cut by using the straight snips.
- The sheet is bent to the required shape using stakes and mallet.
- Now the bent edges are made to overlap each other and stuck with a mallet to get the required joint.
- The joint is soldered.

**PRECAUTIONS TO BE FOLLOWED**

- Care must be taken while cutting snips.
- Care must be taken while bending and joining.

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**HOD/MECH**

