1. **Practice safety procedures in a shop floor environment**

**1. Personal Protective Equipment (PPE)**

* **Wear appropriate PPE** like safety glasses, gloves, ear protection, and steel-toe boots.
* **Lab coats or aprons** for protection against chemicals and sharp tools.
* **Face shields or goggles** for protection against flying debris or chemicals.
* **Hearing protection** in areas with high noise levels.

**2. Work Area Organization**

* Keep the **work area clean** and free from clutter to avoid tripping hazards.
* Maintain **clear access** to emergency exits and fire extinguishers.
* Label **hazardous areas** with warning signs.

**3. Tool Safety**

* Inspect tools and machines before use to ensure they are in good working condition.
* Follow the **manufacturer’s instructions** for proper use.
* Use tools only for their intended purpose.
* **Turn off machines** when not in use or during maintenance.

**4. Electrical Safety**

* Avoid using equipment with exposed wiring or damaged power cords.
* Ensure all machines are **properly grounded**.
* **Unplug equipment** when performing maintenance or changing parts.
* Do not overload electrical circuits.

**5. Machine Operation**

* Always follow **safe operating procedures** for each machine.
* Keep hands and body away from moving parts.
* **Lockout/Tagout (LOTO)** procedures should be followed during maintenance.

**6. Material Handling**

* **Lift heavy objects** correctly, using proper techniques or mechanical aids.
* Store materials in **designated areas** to prevent accidents.
* Use **appropriate lifting equipment** like hoists, cranes, or forklifts.

**8. Fire Safety**

* Ensure that fire **extinguishers** are accessible and functional.
* Be aware of **emergency evacuation routes**.
* Do not store **flammable materials** near open flames or heat sources.
* Know how to **use fire extinguishers** and perform basic first aid.

**9. First Aid and Emergency Procedures**

* Know the location of the **first aid kit** and **emergency contact numbers**.
* Be trained in basic **first aid and CPR**.
* In case of injury, **report immediately** to the supervisor.
* **Know the emergency exits** and assembly areas in case of evacuation.

**10. Safety Training and Awareness**

* Ensure all workers and trainees are **properly trained** in safety protocols.
* Conduct regular **safety drills** (fire, evacuation, etc.).
* Always be aware of **new safety guidelines** or updates.

1. **Select appropriate tools and methods for basic manufacturing processes**

**Exp. 1 Study of welding and Sheet metal Tools**

**(ADD THE FIGURES FOR EACH TOOL)**

1. **Welding Tools**
2. **Hand gloves:** Hand gloves to wear when working with heat. They're extremely resistant to high temperatures, which is why they're common in welding, foundries, and laboratories
3. **Wire brush:** The wire brush is used to clean the surface to be welded.
4. **Flat file:** It is used commonly for general work; it is double cut on face and single cut on side.
5. **Flat tong:** When welding smaller pieces together, for moving the pieces to different welding angles and shifting of pieces for chipping. It is advisable to use a flat tongs.
6. **Earth clamp:** It is connected to the end of the ground cable. It is normally clamped to the welding table or the job itself to complete the electric current.
7. **Flat chisel:** Chisels are used for cutting and chipping away pieces of metal and are made of carbon steel usually rectangular, hexagonal or octagonal cross section. They are forged to shape, roughly ground then hardened and tempered. After this process it is then ground sharp to required correct cutting edge.
8. **Centre punch:** Looks like a prick punch. Its point has an angle more obtuse than that of prick punch. The angle is around 60˚.
9. **Goggles:** Goggles with glasses are used to protect the eyes of the welder from the light sparks produced during welding.
10. **Face shield:** It is known as face shield or helmet. It is used to protect the eyes of the welders from the light sparks produced during welding. It is normally held in hand.
11. **Electrode:** it melts and supplies filler metal to the weld
12. **Electrode holder:** A metal electrode is the device used for holding the electrode mechanically. It conveys electric current from welding machine to the electrode; it has an insulated handle to protect the operator’s from heat.
13. **Chipping hammer:** Chipping hammer is used for chipping the slag coating on weld surface. It consists of a long handle with head made of cast steel.
14. **Metal cleaning brush:** A wire brush is used for **cleaning the welding surface, removal of slag, rust etc**. The brush has stainless steel bristles. When working on stainless steel, a brush with stainless steel bristles and chipping hammer made of stainless steel must always be used.
15. **Spanner:** Double Open Ended Spanner is generally used for tightening and loosening of rotary fasteners such as nuts and bolts.
16. **Ball peen hammer:** Mainly used for chipping and riveting
17. **C- clamp:** These are very basic and can be used for a number of tasks. They do not have the holding power that other types, such as vices, have.
18. **Sheet Metal Tools**
19. **Try square:** It is a woodworking or a metal working tool used for marking and measuring a piece of wood The *square* refers to the tool's primary use of measuring the accuracy of a right angle (90 degrees);
20. **Cutting plier:** Pliers that have a cutting blade on the side of the jaws.
21. **Nose plier:** Long-nose pliers, sometimes referred to as needle-nose pliers, are ideal for jewellery making, working in tight spaces or cutting small-gauge wire. They feature long, slender jaws that make it easy to access hard-to-reach spaces.
22. **Scissor:** Scissors are used for cutting various thin materials, such as paper, cardboard, metal foil, cloth, rope, and wire. A large variety of scissors and shears all exist for specialized purposes.
23. **Straight snip:** It is used to cut or trim along a straight line. The blades in this snip are straight.
24. **Curved snip:** It is used to trim or cut along inside curves. The blades in this snip are curved back from the cutting edge, which permits the sheet to slide over the top blades while cutting.
25. **Combo snip:** COMBINATION SNIPS have **straight jaws for straight cutting** but the inner faces of the jaws are sloped for cutting curves as well as irregular shapes. These snips are available in the same sizes and capacities as straight snips.
26. **Spring divider**: It is similar in construction to a caliper except that both the legs are straight with sharp hardened points at the end. It is used for transferring dimensions, scribing circles and doing general layout work.
27. **Inside spring calliper**: In this type of a caliper the legs are bent outward. This type of Caliper is used for comparing or measuring inside diameter, distance between shoulders, or other parallel surfaces of any inside dimensions.
28. **Outside spring calliper**: An outside spring Caliper is a two-legged Steel instrument with its legs bent inwards. It is used for measuring and comparing thickness, diameters and other outer dimensions. A steel rule must be used in conjunction with them if direct reading is desired.
29. **Steel rule**: It is one of the most useful tools in the workshop for taking linear measurements.
30. **Plastic mallet**: Mallets are soft hammers and are made of raw hide, hard rubber, copper, brass, Lead, or wood. It is mostly used to strike soft metal and give light blow on sheet metal.
31. **Wooden mallet:** Mallets are soft hammers and are made of raw hide, hard rubber, copper, brass, Lead, or wood. It is mostly used to strike soft metal and give light blow on sheet metal.
32. **Ball peen hammer**: Mainly used for chipping and riveting
33. **Round stake:** It is used to form a conical or tapering job.
34. **Half-moon stake**: It is used to form a round seam joint on the inner side of the job.
35. Soldering iron: Soldering iron is used for soldering work and it consists of a copper bit held by a steel rod and wooden handle. They are many types of soldering iron like copper bit, hatchet adjustable and soldering iron.

**Composition of solder:**

Usually tin 60% and lead 40% used for electrical work.

Tin 50% and lead 50% used machine soldering.

Tin 30% and lead –70% used for plumber solder.

1. **Standard wire gauge**: This is used to measure the diameter of the wire or thickness of the sheet metal.
2. **Marking scriber**: It is used for drawing lines in the metal parts to layout the job. It is made of hardened steel.
3. **Flat file:** It is used commonly for general work; it is double cut on face and single cut on sides.
4. **Perform basic metals joining using welding and soldering.**

**Exp. No. 2**

**Soldering**

**Aim:**

**Material used:**

**Tools required:**

**Procedure:**

**Result:**

**Figure: (typical for your reference)**

* 1. Draw and develop a sheet metal model using soldering techniques. Note: Dimensions are in millimetres."

A diagram of a diagram of a triangle and a triangle

Description automatically generated

**Ans:**

**Exp. 3 BUTT joint**

**A white paper with black text

Description automatically generated**

**A close-up of a text

Description automatically generated**

A black text on a white background

Description automatically generated

**A drawing of a weld

Description automatically generated**

**Exp. 4 LAP JOINT**

**Aim**

To join the given two work pieces as a lap joint by arc welding.

**Material used**

Mild Steel plates.

**Tools required**

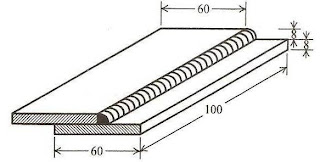
1. Welding power supply
2. Flat file
3. Welding rod
4. Chipping hammer
5. Electrode holder
6. Wire brush
7. Gloves and apron
8. Earthing clamps
9. Shield and goggles

**Procedure**

1. The given workpieces are thoroughly cleaned, i.e. rust, scales are removed and the edges are filed.
2. The electrode is held in an electrode holder and ground clamp is clamped to the welding plates and the power is supplied.
3. The workpieces are positioned on the table to form a “Lab joint”.
4. The tag weld is done on the both the ends of joining plates to avoid the movement of workpieces during welding.
5. The welding is carried throughout the length of the workpieces on both sides by maintaining 3mm gap between plates and the welding rod.
6. The welded plates are allowed for air cooling after the slags are removed.
7. The weld joint portions are cleaned by wire brush.

**Result**

Thus the required Lap joint is made by arc welding process.

[](https://4.bp.blogspot.com/-5H2ZpLBA57o/Ugegh_YblZI/AAAAAAAAAHk/kJ6dI5-P-dY/s1600/Lap+joint.jpg)

1. **Build simple geometries using additive manufacturing process**

**Additive Manufacturing**

**Exp. 5 *Introduction to 3D Modeling Software***

* **Common CAD Software:** SolidWorks, AutoCAD, Fusion 360, TinkerCAD.
* **General Steps to Export:**
  1. **Create or open a 3D model** in your CAD software.
  2. **Check the model for errors:** Ensure it is "watertight" (no gaps or holes in the geometry).
  3. **Choose Export/Save As option:**
     + Select STL as the output format.
  4. **Adjust Resolution Settings:**
     + High resolution for detailed models.
     + Medium or low resolution for less complex objects to reduce file size.
  5. **Save the STL File** to a designated folder for slicing.

**Paste Drawing (your design)**

**Exp. 6 Introduction to Slicing Software and 3D printing**

**Adjusting Slicing Parameters**

* **Layer Height:**
  + Defines the thickness of each printed layer.
  + **Lower layer height:** Higher resolution but slower print.
  + **Higher layer height:** Faster print but lower resolution.
* **Infill Density:**
  + Determines how solid the model is inside.
  + **Low infill (10-20%):** Suitable for decorative models.
  + **High infill (50-100%):** Required for functional parts.
* **Infill Patterns:**
  + Grid, honeycomb, and triangle patterns.
  + Honeycomb is often stronger and more material efficient.
* **Support Structures:**
  + Added for overhangs exceeding 45°.
  + Types: Tree supports, grid supports.
  + Placement: Ensure minimal contact with visible surfaces.
* **Other Parameters:**
  + Print speed: Faster speeds reduce quality.
  + Bed adhesion settings: Skirt, brim, or raft.

**Setting Up a 3D Printer**

1. **Calibration**
   * Importance of calibration for accurate prints.
   * Steps:
     + Home the printer.
     + Ensure the axes move smoothly.
2. **Bed Leveling**
   * Manual vs. automatic leveling.
   * Use a sheet of paper to check nozzle clearance.
   * Adjust screws or settings until the gap is uniform.
3. **Filament Loading**
   * Preheat the extruder to the filament’s melting temperature.
   * Insert the filament and use the feeder mechanism to load it.
   * Check for smooth extrusion.

**Paste the Printed Model picture**