



**Chandigarh Engineering College  
Jhanjeri Mohali-140307  
Department of Applied Sciences**

**FITTING SHOP**

**SYLLABUS**

Introduction of fitting practice and tools used in fitting shop; exercise involving marking, cutting, fitting practice (Right Angles), male- female mating parts practice, tapping practice.

**Instructor In charge: Mr. Tarlochan Singh**

## **FITTING SHOP**

The term *fitting*, is related to assembly of parts, after bringing the dimension or shape to the required size or form, in order to secure the necessary fit. The operations required for the same are usually carried out on a work bench, hence the term *bench work* is also added with the name *fitting*.

The bench work and fitting plays an important role in engineering. Although in today's industries most of the work is done by automatic machines which produces the jobs with good accuracy but still it (job) requires some hand operations called fitting operations. The person working in the fitting shop is called fitter

### **FITTING TOOLS:**

Fitting shop tools are classified as below:

- ☐ Work Holding Devices/ Clamping Tools.
- ☐ Measuring and Marking Tools.
- ☐ Cutting Tools.
- ☐ Striking Tools.
- ☐ Drilling Tools.
- ☐ Threading Tools.

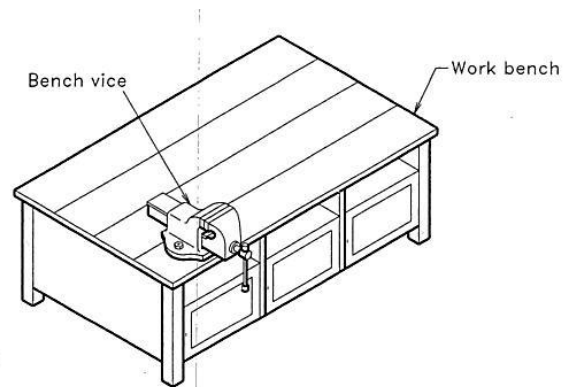
### **WORK HOLDING DEVICES /CLAMPING TOOLS:**

#### **Work Bench :**

A fitting process can be done at various places, but most of the important operations of fitting are generally carried out on a table called *work bench*.

The work bench is a strong, heavy and rigid table made up of hard wood.

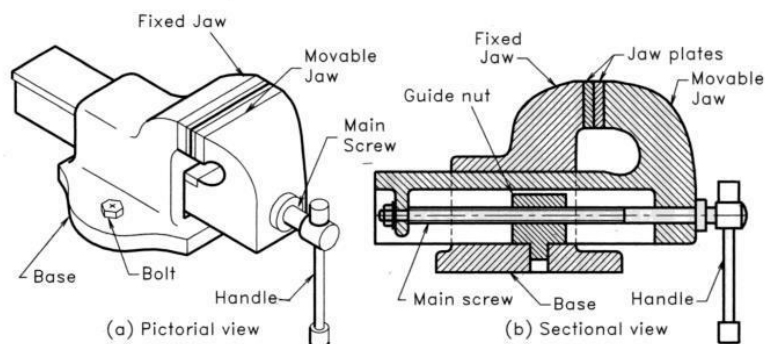
The size of the work bench required is about 150 to 180 cm length, nearly 90 cm width and approximately 76 to 84 cm height.



## BENCH VICE:

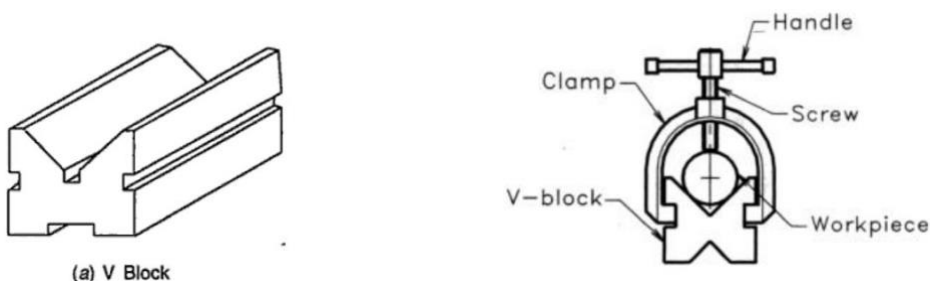
It is firmly fixed to the bench with the help of nuts and bolts. It consists of a cast Iron body and cast iron jaws. Two jaw plates are fitted on both the jaws. The holding surface of the jaw plates is knurled in order to increase the gripping. Jaw plates are made up of carbon steel and are wear resistant. One jaw is fixed to the body and the second slides on a square threaded screw with the help of a handle.

The jaws are opened up to required length; job is placed in the two jaws and is fully tightened with the help of handle. Handle is used to move the movable jaw



## V Block :

In V Block, V grooves are provided to hold the round objects longitudinally. The screw of the clamp applies the holding pressure. When the handle is rotated there is movement in the screw.



## II. MEASURING TOOLS

### Steel Rule

These are made up of stainless steel and are available in many sizes ranging from 1/2 ft. to 2 ft. These are marked in inches or millimeters. All the faces are machined true. The edges of steel rule should be protected from rough handling.

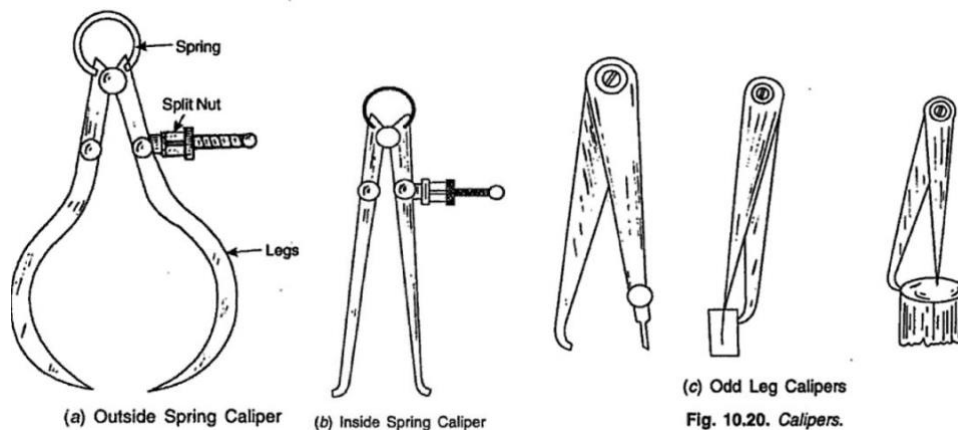


Fig. 10.15. Steel Rule.

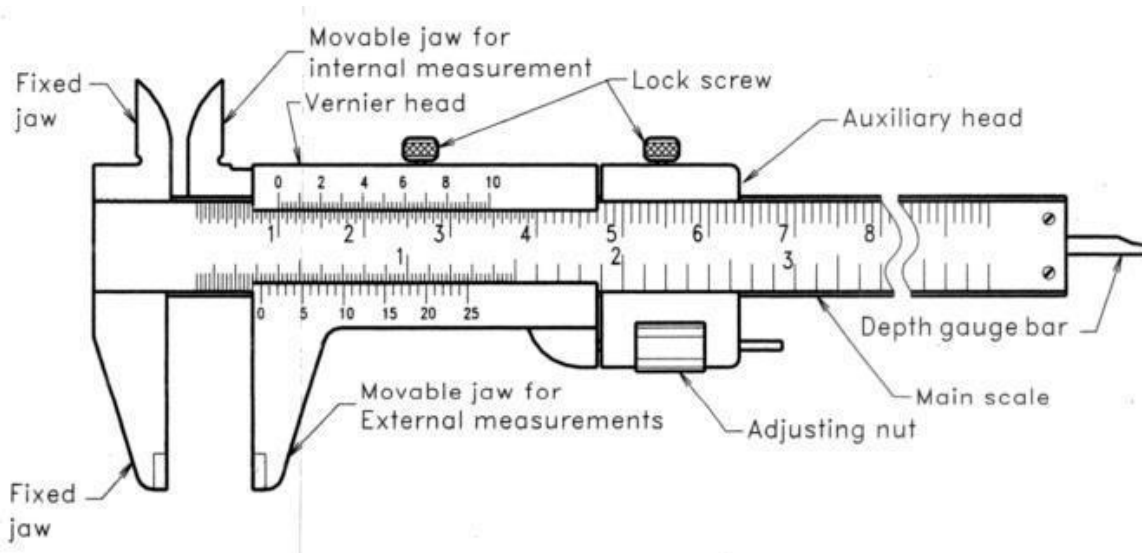
### Calipers :

These are generally used to measure the inside or outside diameters. Different types are:

- i. Outside Caliper: It is used to measure the outside dimensions.
- ii. Inside Caliper: It is used to measure the inside dimensions.
- iii. Spring Caliper: Spring is provided to apply the pressure and lock nut is provided to lock any desired position.
- iv. Hermaphrodite, Jenny or Odd leg Caliper: One leg is bent at the tip inwardly and the other has a straight pointed end. It is used to scribe lines parallel to the straight edges.

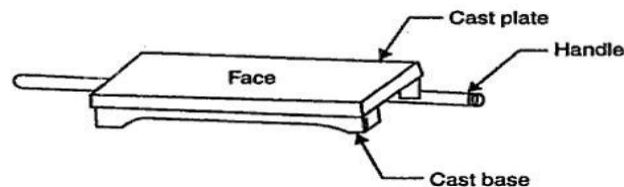


**Vernier Caliper:** It is used for measuring the outer dimensions of round, flat, square components and also the inner size of the holes and bore. A narrow blade is used to measure the depth of bar slots etc. The reading accuracy in metric system is 0.02 mm and British system it is 0.001". It is made of stainless steel.



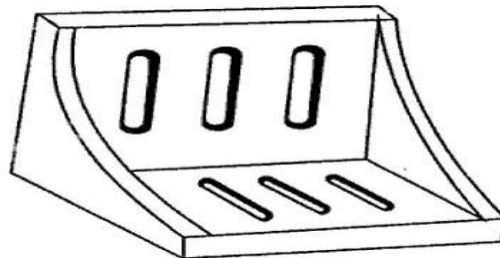
#### MARKING TOOLS:

**Surface Plate:** It is used for testing the flatness, trueness of the surfaces. It is made up of cast iron or graphite. Its upper face is planed to form a very smooth surface. It is also used in scribing work. While not in use, it should be covered with a wooden cover.



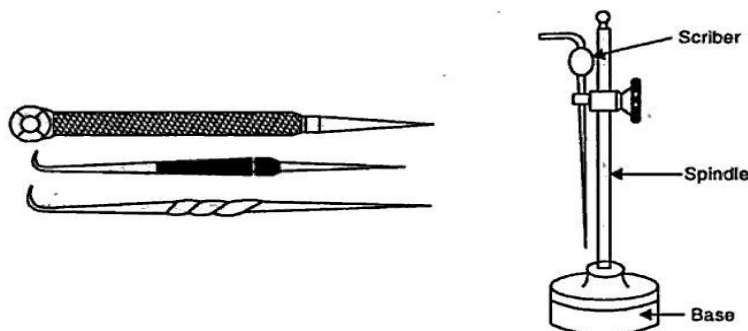
#### Angle Plate:

It is made up of cast iron in different sizes; it has two planed surfaces at right angles to each other and has various slots in each surface to hold the work by means of bolts and clamps. Never do hammering on the angle plate to fasten (loosen) the nuts and bolts.



#### Scriber and Surface Gauge:

It consists of a cast iron base on the center of which a steel rod is fixed vertically. Scriber is made up of high carbon steel and is hardened from the front edge. It is used for locating the centers of round bars or for marking of the lines.



Scriber and Surface Gauge

**Punches:** Punches are used for marking purposes. Dot punches are used for marking dotted line and centre punch is used to mark the centre of hole before drilling. Punches are made up of high carbon steel or high speed steels. One end is sharpened. Hammering is done on the second end while working. For dot punch, angle of the punching end is 60 degree while in centre punch angle of punching end is 90 degree.

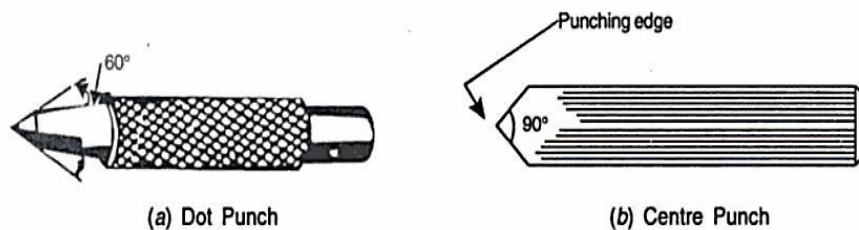


Fig. 10.14. Punches.

**Try Square:** It is used for checking squareness of two surfaces. It consists of a blade made up of steel, which is attached to a base at 90 degree. The base is made up of cast iron or steel. It is also used to mark the right angles and measuring straightness of surfaces. Never use try square as a hammer.

### 3. Vernier Height gauge:

Vernier height gauge consists of a heavy base, a graduated beam, a sliding head with Vernier sliding Jaws holding the scribe and a fine adjustment clamp. It is similar to large Vernier calipers in construction, except that it consists of a heavy base which allows the gauge to stand upright instead of a fixed jaw in Vernier. The movable jaw of Vernier height gauge consists of a projection or extension which is leveled to sharp edge for scribing lines at any required height

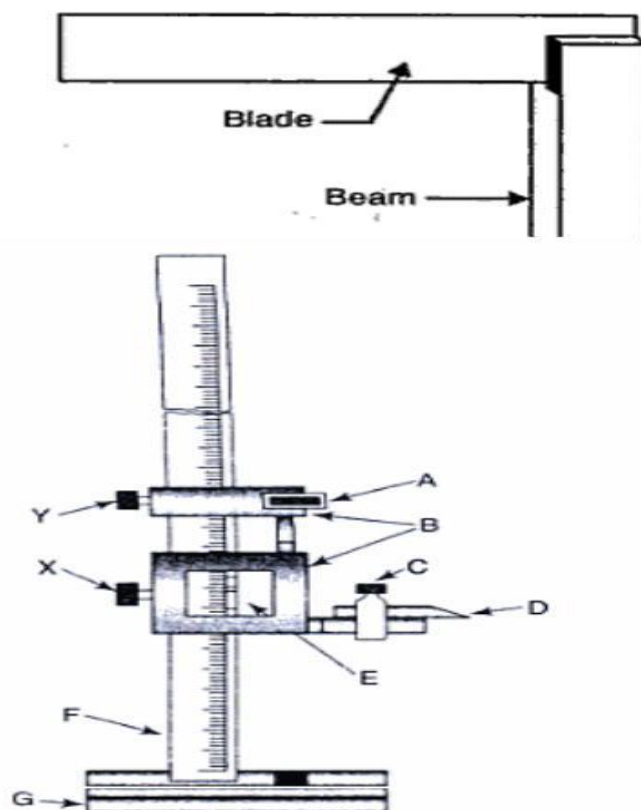


Fig. 3.17 Vernier height gauge

A—Fine adjustment of nut      B—Vernier slide  
C—Scriber clamp screw          D—Scriber  
E—Vernier scale      F—Main scale      G—Base  
X, Y—Lock screws

## IV CUTTING TOOLS



## 1. Files

Files are multi points cutting tools. It is used to remove the material by rubbing it on the metals. Files are available in a number of sizes, shapes and degree of coarseness.

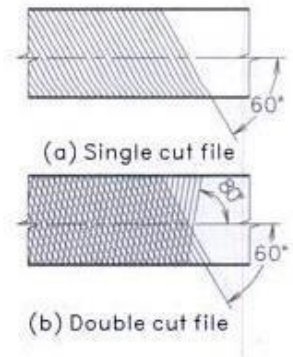
### Classification of files

#### i. On the basis of length

4", 6", 8", 12"

#### ii. On the basis of grade:

- ☐ Rough (R)(20 teeth per inch)
- ☐ Bastard (B)(30 teeth per inch)
- ☐ Second cut (Sc) (40 teeth per inch)
- ☐ Smooth file (S)(50 teeth per inch)
- ☐ Dead smooth (DS)(100 teeth per inch)



Rough and bastard files are the big cut files. When the material removal is more, these files are used.

These files have bigger cut but the surface produced is rough.

Dead smooth and smooth files have smaller teeth and used for finishing work. Second cut file has degree of finish in between bastard and smooth file.

#### iv. On the basis of number of cuts:

- ☐ Single cut files.
- ☐ Double cut files.
- ☐ Rasp files.

In single cut files the teeth are cut in parallel rows at an angle of 60 degree to the face. Another row of teeth is added in opposite direction in case of double cut files. Material removal is more in case of double cut files.



#### ii. On the basis of shape and size:

The length of the files varies from 4' to 14\*. The various shapes of cross-section available are hand file, flat file, triangular, round; square, half round, knife-edge, pillar, needle and mill file.





**Flat file:** This file has parallel edges for about two-thirds of the length and then it tapers in width and thickness. The faces are double cut while the edges are single cut.

**Hand file:** for a hand file the width is constant throughout, but the thickness tapers as given in flat file. Both faces are double cut and one edge is single cut. The remaining edge is kept uncut in order to use for filing a right-angled corner on one side only.

**Square file:** It has a square cross-section. It is parallel for two-thirds of its length and then tapers towards the tip. It is double cut on all sides. It is used for filing square corners and slots.

**Triangular file:** It has width either parallel throughout or upto middle and then tapered towards the tip. Its section is triangular (equilateral) and the three faces are double cut and the edges single cut. It is used for filing square shoulders or comers and for sharpening wood working saws.

**Round file:** It has round cross-section. It carries single cut teeth all round its surface. It is normally made tapered towards the tip and is frequently known as rat-tail file. Parallel round files having same diameter throughout the length are also available. The round files are used for opening out holes, producing round comers, round-ended slots etc.

**Half-round file:** Its cross-section is not a true half circle but is only about one-third of a circle. The width of the file is either parallel throughout or upto middle and then tapered towards the tip. The flat side of this file is always a double cut and curved side has single cut. It is used for filing curved surfaces.

**Knife edge file:** It has a width tapered like a knife blade and it is also tapered towards the tip and thickness. It carries double cut teeth on the two broad faces and single cut teeth on the edge. It is used for finishing sharp corners of grooves and slots.

**Diamond file:** Its cross-section is like a diamond. It is used for special work

**Needle file:** These are thin small files having a parallel tang and a thin, narrow and pointed blade made in different shapes of its cross-section to suit the particular need of the work. These



are available in sizes from 100 mm to 200 mm of various shapes and cuts. These files are used for filing very thin and delicate work.

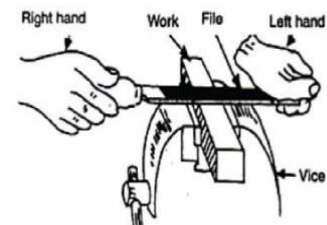
### Methods of filing

The following are the two commonly used methods of filing:

1. Cross-filing
2. Draw filing.

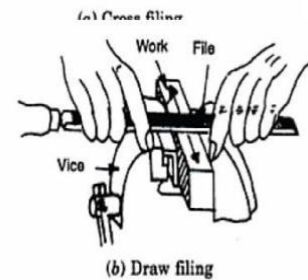
#### Cross - filing

This method is used for efficient removal of maximum amount of metal in the shortest possible time. It may be noted that the file must remain horizontal throughout the stroke (long, slow and steady) with pressure only applied on the forward motion.



#### Draw filing

This method is used to remove file marks and for finishing operations. Here, the file is gripped as close to the work as possible between two hands. In this filing method, a fine cut file with a flat face should be used.



### Hacksaw

Hacksaw is used for cutting of rods, bars, pipes, flats etc. It consists of a frame, which is made from mild steel. The blade is placed inside the frame and is tightened with the help of a flange nut. The blade is made up of high carbon steel or high speed steel.

The points of the teeth are bent in a zig-zag fashion, to cut a wide groove and prevent the body of the blade from rubbing or jamming in the saw cut. The teeth of the blades are generally forward cut so in the case, pressure is applied in the forward direction only. Depending upon the direction of cut, blades are classified as:

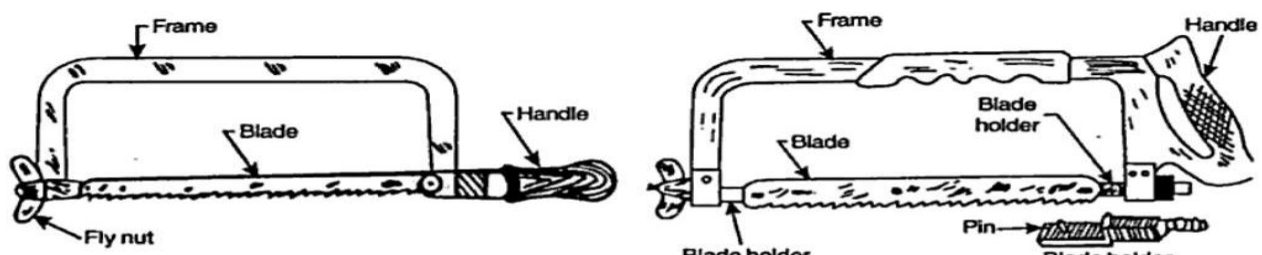
- Forward cut
- Backward cut.

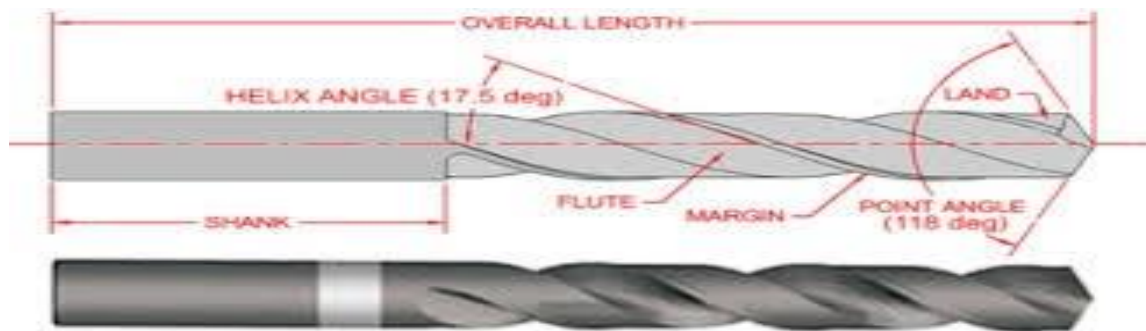
Depending upon the pitch of the teeth (Distance between the two consecutive teeth) blades are classified as:

- ☐ Coarse (8-14 teeth per Inch)
- ☐ Medium (16-20 teeth per inch)
- ☐ Fine (24-32 teeth per inch)

**Drilling Tools :** Drilling is a process of making holes in the solid metal with the help of a multi-point cutting tool, called a drill bit.

**Twist drill :** Twist drills are used to drill a hole in a metal part or any other material.





**Reamer :** Reamers are used to finish the already drilled holes since the drill does not produce always correct degree of accuracy and for finishing the hole, a reamer is used after drilling the hole for enlarging and finishing the hole to size.



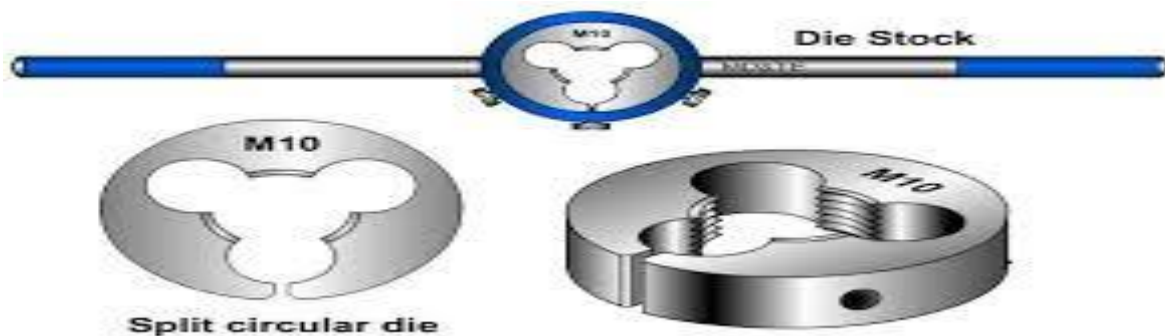
**Threading Tools :**

**Taps :** Tapping is the process of cutting internal threads into a drilled hole by using a tap.

Taps are made of High Speed Steel (H.S.S.) or High Carbon Steel (H.C.S.)



**Die and die stock :** Die and die stock are used for cutting external thread. Dies are made from tool steel and have internal threads. By holding the die into die stock, the handle is rotated by hand.





**FITTING SHOP**

**Question & Answers**

**Question -** Classify the tools used in fitting shop.

**Answers -** Holding tool, Marking tools, Measuring tools, Cutting tools, Striking tools, Threading tools.

**Question-** Name any three holding devices in fitting shop.

**Answers-** Bench Vice, Pin Vice, Hand Vice.

**Question -** What is the material of centre punch ?

**Answers -** High carbon steel.

**Question-** What is the point angle of a dot punch ?

**Answers -** 60 degree

**Question-** What is the material of a surface plate ?

**Answers -** Graphite , Cast iron.



# **Chandigarh Engineering College**

## **Jhanjeri Mohali-140307**

### **Department of Applied Sciences**

**AIM :** Perform the various operations of Fitting Shop

**MATERIAL REQUIRED:** Mild Steel Flat (50\*50\*6 mm)

**TOOLS REQUIRED:** Scriber, Try Square, Centre & Dot Punch, Ball Peen Hammer, Surface Plate, Surface Gauge, Bench Vice, Drill, Tap, Reamer, V-Block, Hand Hacksaw, Bastard & Smooth File.

**MEASURING INSTRUMENT:** Vernier Caliper, Steel rule, vernier height gauge.

**OPERATIONS:**

1. Cut the materials from M.S.Flat of required size (50\*50\*6 mm).
2. Make two sides of piece at 90° with bastard file.
3. Marking according to drawing with marking tools.
4. Make all sides of piece in right angle & maintain size.
5. Drilling Reaming & Tapping all operations done one by one.
6. Hack sawing operation done with hand hacksaw.
7. Final checking of finishing with smooth file.
8. Roll No. Punching.

**PRECAUTION:**

1. Properly clamp the job in bench vice.
2. Do not strike the surface plate.
3. Do not wear tie while operating Drill machine.
4. Never apply excess pressure while drilling.