

Mechanical Workshop Practice in Lab II

Hafiz Muhammad Rizwan

04-Oct-2016

Workshop Processes for Practice

The areas in which the physics students are given workshop practice can be broadly divided into two sections as mentioned below.

1. Hand working processes
2. Machining processes

1. Hand working processes: The shaping of a part of can equipment or machine by hand operations using hand tools or equipment, can be considered as hand-working process. The commonly practiced hand-working processes are mentioned below:

1. Hand drill machine
2. Hacksaw
3. Hammer
4. Filing tool

2. Machining processes: Using metal cutting machine tools, the machining operations are executed to shape parts.

The loading of the work piece, control of the machining operations, the unloading and inspection are done manually. The conventional machining operations practiced are as follows:

1. Turning
2. Drilling
3. Milling
4. Grinding
5. CNC lathe

Safety Measures

Safety is the primary requirement that a worker or student should learn before he starts working in a workshop. A student can easily learn how to work safely. Rules and regulations, mechanical guards and devices, posters and lectures about safety measures are very important, but they will never replace intelligent precautions taken by the student in doing work. A good and safe worker is the one, who is safety-conscious and always adopt safe and accepted procedures. The following are types of safety.

1. Safety of the worker
2. Safety of the job
3. Safety of the machines, tools and equipment.

Wear safe clothing

Wear tight shirt or dress while working inside the workshop. For good protection of the clothing, shop apron may be worn. Wear shoes with thick soles. Do not wear rings, watches, bracelets, or other jewelry that could be caught in moving machine parts.

Safety measure while working the machines

While working with machines, the guard should be in position. Replace them immediately after repairs, if any. Do not try to clean or repair a machine, if it is in motion. Cutting tools and workpiece on any machine should be clamped securely before starting. An operator of a machine should not lean against a machine.

Take precaution while using machine and hand tools:

Hacksaw

Don't test the sharpness of the blade of a saw by running finger across the teeth. While using a saw, check whether there is proper tension of the blade. Don't apply heavy pressure or sideways force on the saw, because it may break the blade and even cause injury to hand.

Milling Machine

Fix the drill bit tightly on the chuck and remove the tightening key. Clamp the work piece on the machine vice before starting drilling. The drilling surface should be perpendicular to the axis of rotation of the bit. A punch mark at the position of drilling can give accuracy in whole location. While drilling of small diameter, (less than 5mm) the axial load should be low in order to protect the bit from breaking. Clean the chips from the machine table using a brush.

Lathe machine

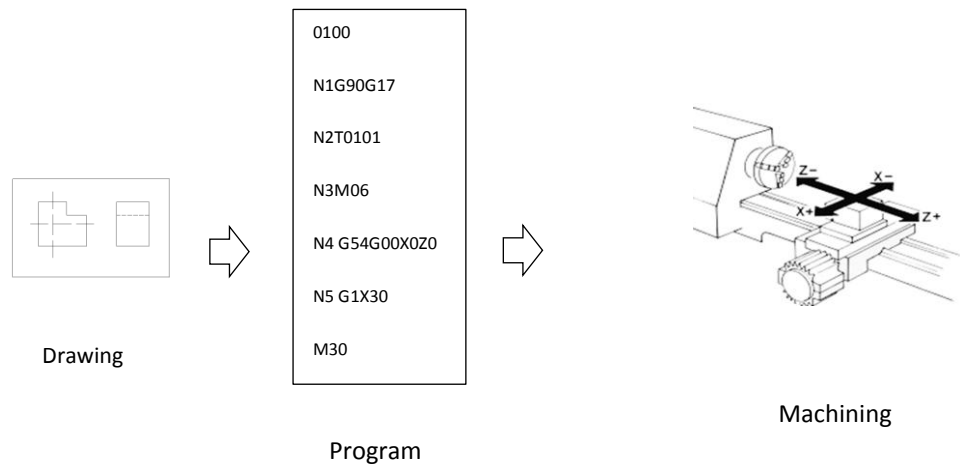
Before starting the machine, clamp the job on the chuck solidly. Turn the chuck by hand to inspect the working, prior to the starting of machine. Keep the machine clear of tool and then start. Don't stop the rotation of machine chuck by hand. Take measurement only after stopping the machine. Don't remove chips by hand. Use brush or plier if necessary, to remove long chips while working on the lathe, only operator has to switch on/off the machine and not by a second person.

CNC Lathe machine (Turning Center)

Turning center with increase capacity tool change is also making a strong appearance in modern production workshop. The CNC machine is capable of executing many different types of lathe cutting operations simultaneously on a rotating part.

Fundamentals of programming

Programming is the task of picking up dimensions or numeric values from drawing and coding them, according to certain rules, into numerical information for instructing the NC machine to operate. the information generated is called "Program".



Types of Programming

a. Manual programming

This refers to the act of creating Numerical Control program entirely through “manual calculation”.

b. Automatic programming

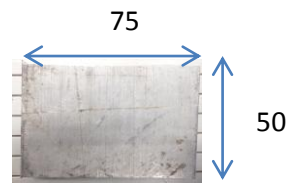
As the geometry to be machined get complex like 3D profile, it becomes difficult to create programs through manual calculations. Such program is created by the help of a special-purpose computer software.

Tasks to be completed on 4th-Oct-2016

Material

Aluminum block 75x50x12 (all dimensions in mm)

Aluminum rod $\phi 40 \times 60$



Practical Exercise steps:

1. Marking
2. Center punching on work piece by hammer
3. Drilling M3, M4 and M5 holes
4. Taping M6x1, 1/4-20 tpi
5. Cut off the work piece by hacksaw on section A-A. Drawing is attached.

1. Marking

Use provided vernier caliper to measure and marks the center points on the aluminum block. These are the points that will be drilled later on.

2. Center punching

Use “hammer” and “center punch” to punch mark the center points measured in the first step.

3. Drilling

Now you are provided with drill size of drill bits (M3, M4 and M5). “M” here stands for “Metric” size which is a standard for drill size in “mm”. Use the required size drill bit to marks hole in the block.

4. Taping

To use a tap, choose the size that is appropriate for the size of the bolt or the hole you want to thread. Place the tap into the special wrench and tighten it in. Then, place the cutting end of the tap over the hole and turn. Use cutting oil to lubricate the tap. As with the die, once the tap is started, make a slight reverse turn every now and then.

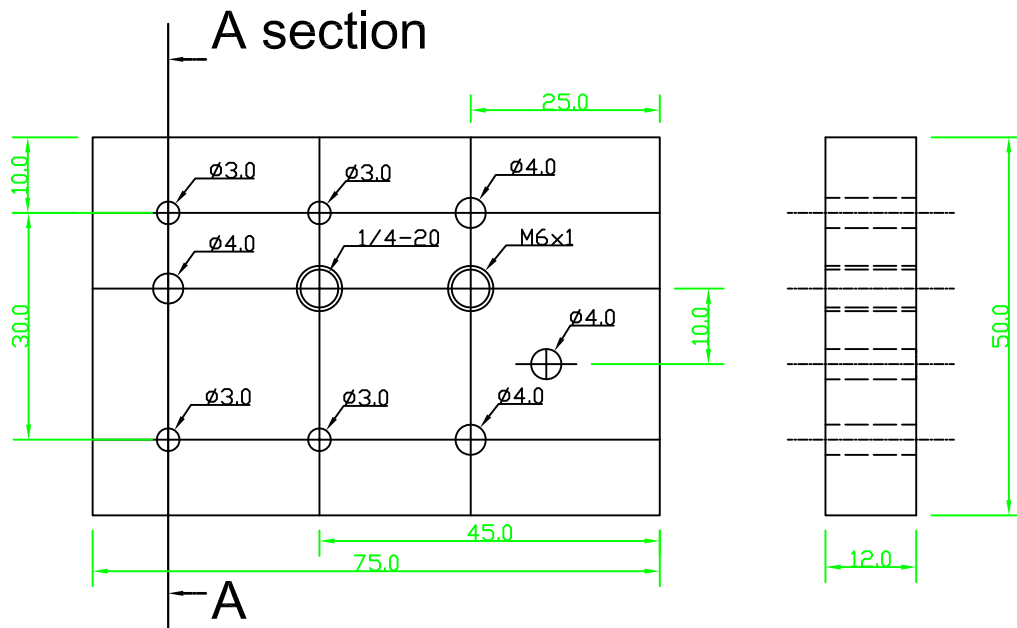
5. Cutting

Now, use scribe to mark out the block again, this time for “cutting” operation. You will be using the “Hacksaw” tool. See the attached drawing (section A-A) to identify the location for cutting.

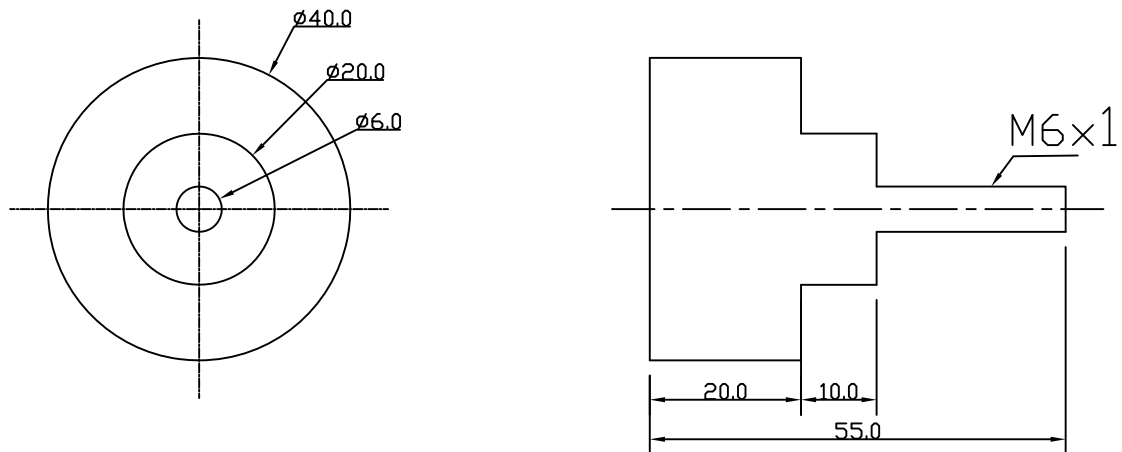
Note:

Manual Lathe and CNC Lathe demos as per cylindrical job will be shown after the practical work.

Milling and drilling drawing



Lathe machining drawing



QUANTITY	MATERIAL	Aluminun	SCALE	1:1	UNIT: mm
DESIGNED BY	H.Muhammad.Rizwan	REQUESTED BY	PHY 300	DATE	30-sep-2016
PHYS LAB (SBASSE) LUMS		PART NAME.	DWG NO 1		
		Mechanical Workshop Excercise	PRINCIPAL INVESTIGATOR	DR.SABIEH ANWAR	SHEET A4