

Basic Manufacturing Systems

[ME1083]

School Of Mechanical Engineering
KIIT Deemed to be University

Introduction to Turning Section

- **What is Turning?**
- Turning is a form of machining, a material removal process, which is used to create cylindrical parts by cutting away unwanted material.
- It requires a turning machine or Lathe, workpiece, fixture and cutting tool.
- The cutter is typically a single-point cutting tool that is secured in the machine, although some operations make use of multi-point tools
- Turning is used to produce parts that have many features, such as holes, grooves, threads, tapers, various diameter steps, and even contoured surfaces

Introduction to Turning Section

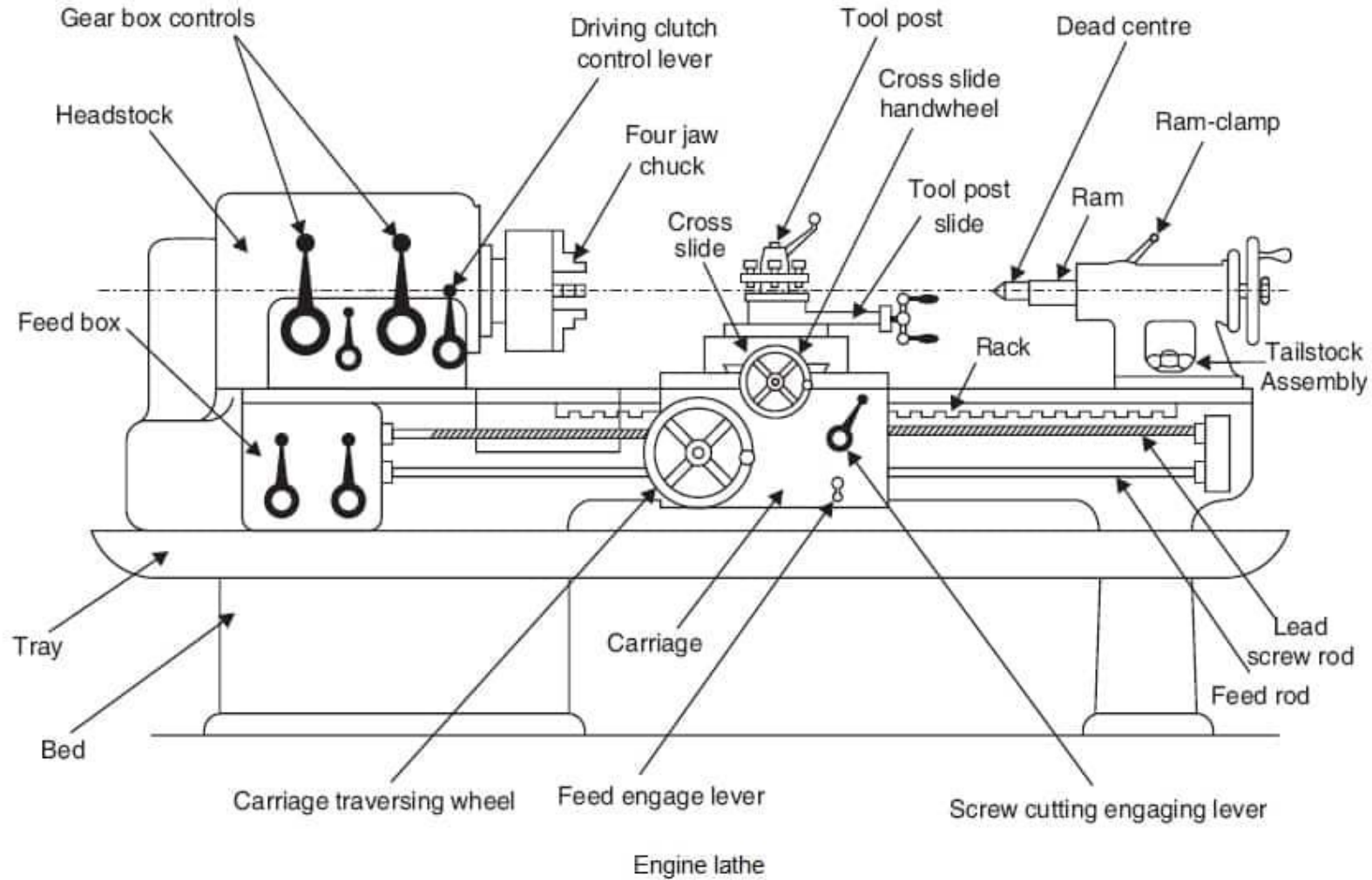
- **Lathe machine:** A lathe machine is a machine tool that is used to remove metals from a workpiece to give a desired shape and size
- The Lathe is the most versatile machine tool among all standard of the machine tool.
- The function of Lathe is to *remove the metal in the form of chips* from a piece of work by mounting the same rigidly on a machine spindle and revolving at the required speed
- And the cutting tool is fed against the work either longitudinally or crosswise to make the work to the required shape and size.

Introduction to Turning Section

- A lathe machine consists of several parts like:

- | | |
|-------------------------|-----------------------|
| 1. Headstock | 2. Bed |
| 3. Tailstock | 4. Carriage |
| 5. Saddle | 6. Cross-slide |
| 7. Compound rest | 8. Toolpost |
| 9. Apron | 10. Lead Screw |
| 11. Feed rod | 12. Chuck |
| 13. Main spindle | 14. Leg |

Lathe Machine



Lathe Machine

- **Types of Lathe machine:**

- Lathe machine has been categorized into the following types:
- Center or Engine Lathe
- Speed Lathe
- Capstan and Turret Lathe
- Tool Room Lathe
- Bench Lathe
- Automatic Lathe
- Special Purpose and CNC Lathe Machine

Lathe Machine

- **Types of Lathe machine:**

- Lathe machine has been categorized into the following types:
- Center or Engine Lathe
- Speed Lathe
- Capstan and Turret Lathe
- Tool Room Lathe
- Bench Lathe
- Automatic Lathe
- Special Purpose and CNC Lathe Machine

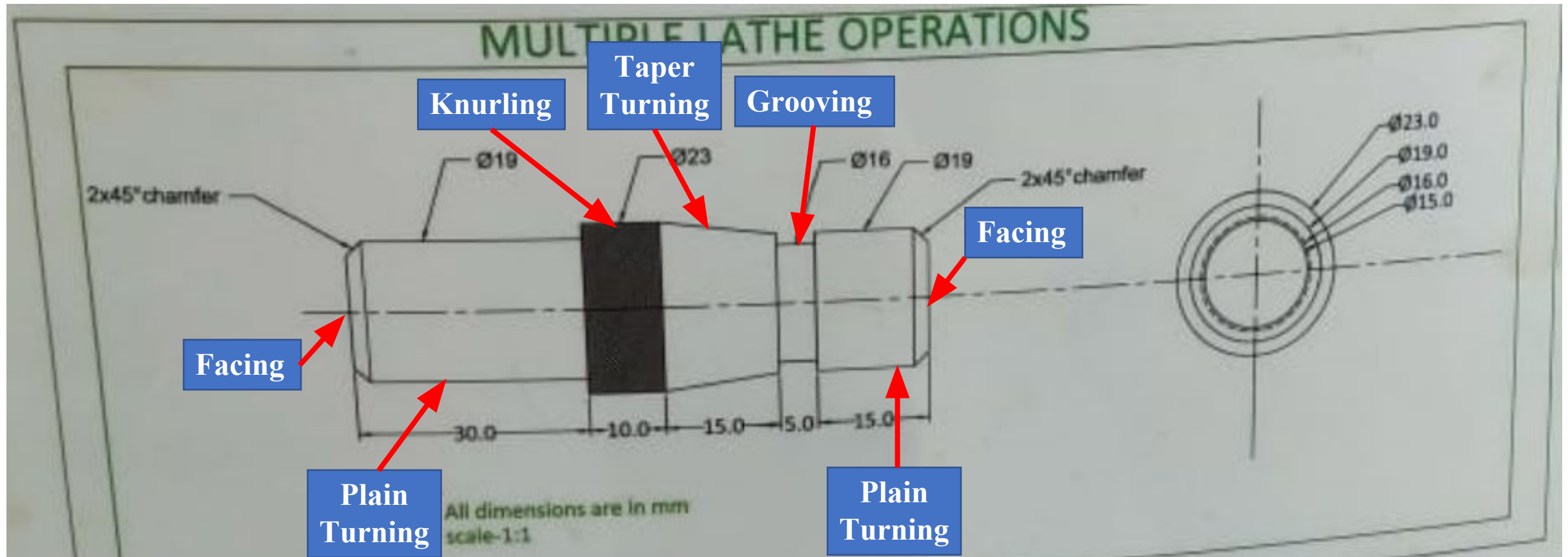
Lathe Machine Specification

- **A Lathe is generally specified by:**
- Swing- the largest work diameter that can be swung for the lathe bed.
- The distance between the headstock and tailstock center.
- Length of the bed in a meter.
- The pitch of the lead screw.
- Horsepower of the machine.
- Speed range and the number of speeds of HS spindle.
- The weight of the machine in a tonne.

Turning Section Experiment

- **Aim of experiment:** To prepare a **Cylindrical job of multiple lathe operations**
- **Raw Material Required:** **MS round bar [$\varnothing 25\text{mm} \times 82\text{mm}$]**
- **Tools required:** Steel rule, Chuck key, Marking block, tool post key, V-cutting tool, knurling tool, packing, Vernier caliper, grooving tool, brush
- **Operations involved: Six different operations**
 - Facing
 - Plain turning
 - Grooving
 - Taper Turning
 - Knurling
 - Step Turning

Layout of the Job



Procedure

- **Step by step procedure**

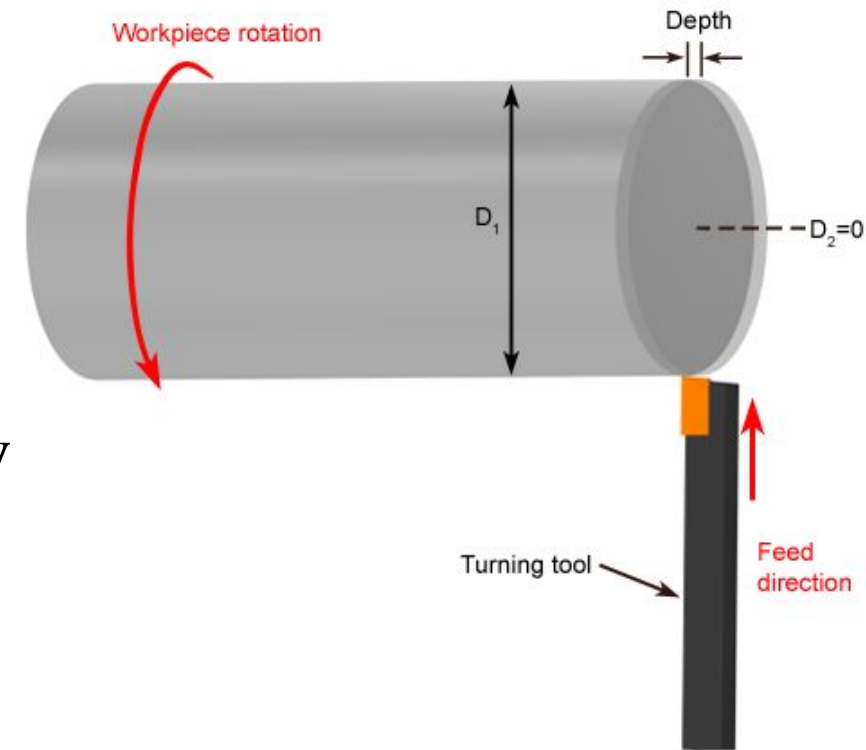
- Fix the cylindrical workpiece in the chuck using chuck key and true it by using marking block
- Fix the single point cutting tool in the tool post so that its cutting point coincides with the axis of the job
- Perform facing, plain turning and chamfering operation as per requirement
- Fix the grooving tool to perform the grooving operation
- Then, fix the knurling tool to do the knurling operation

Safety Precautions

- Safety precautions to be followed in **Turning** section
 - Always **wear gloves**, to avoid injuries to hand by sharp edges and corners of the cut piece
 - Maintain **proper distance from the machine** to avoid any inadvertent accident
 - **Wear glass** to avoid striking of cutting chips into your eyes
 - Do not wear loose dresses and make sure you are tying your hair tightly

Facing Operation

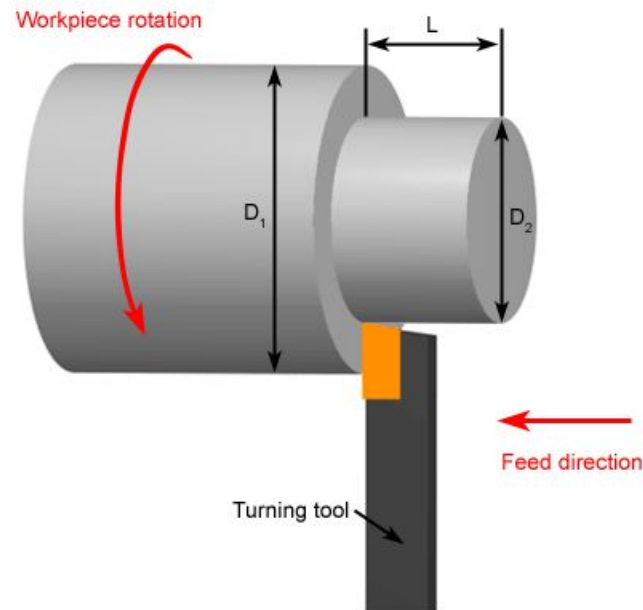
- **Facing operation:** A single-point turning tool moves radially, along the end of the workpiece, removing a thin layer of material to provide a smooth flat surface.
- The depth of the face, typically very small, may be machined in a single pass or may be reached by machining at a smaller axial depth of cut and making multiple passes.
- Tool used is: Single point cutting tool



Copyright © 2007 CustomPartNet

Plain Turning Operation

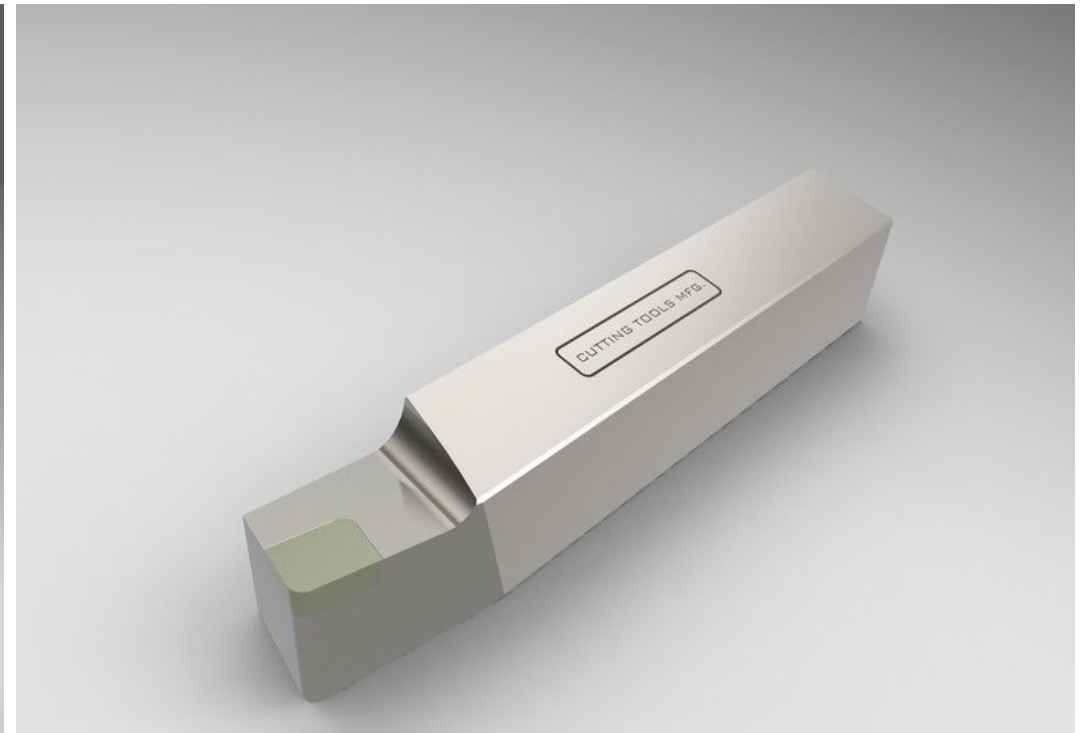
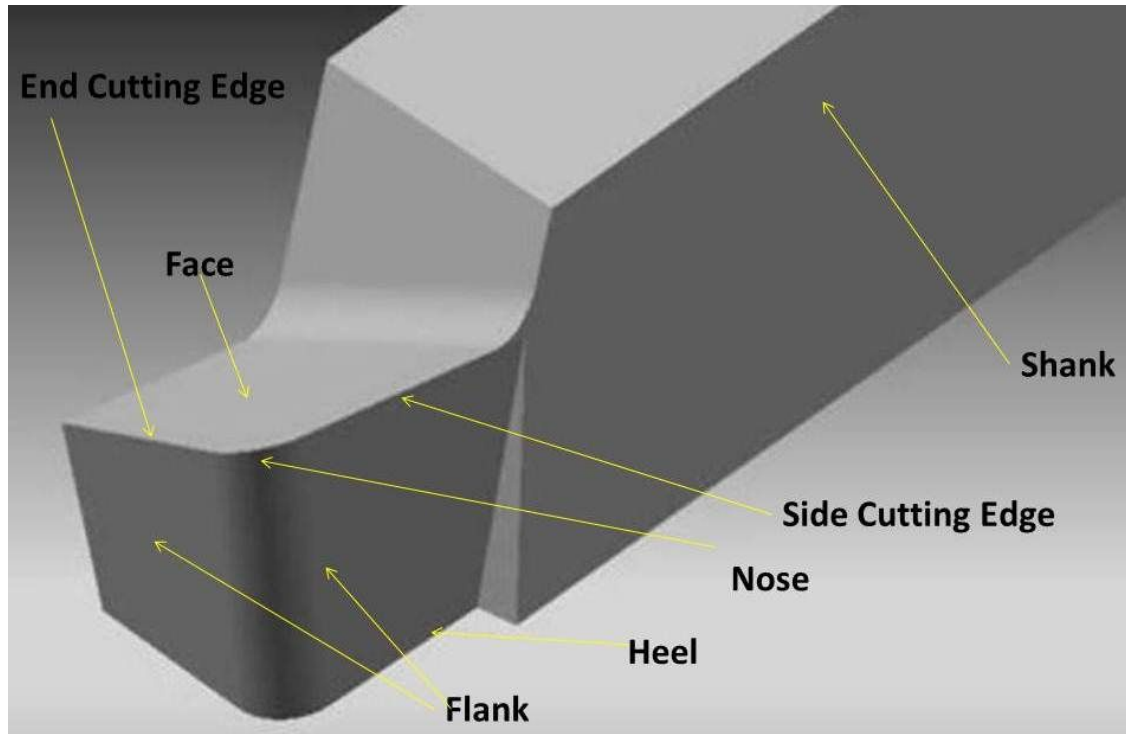
- Plain Turning Operation: A single-point turning tool moves axially, along the side of the workpiece, removing material to form different features, including **steps**, **tapers**, **chamfers**, and **contours**. These features are typically machined at a small radial depth of cut and multiple passes are made until the end diameter is reached.



Copyright © 2007 CustomPartNet

Plain Turning - Tool

- Tool used is: Single point cutting tool



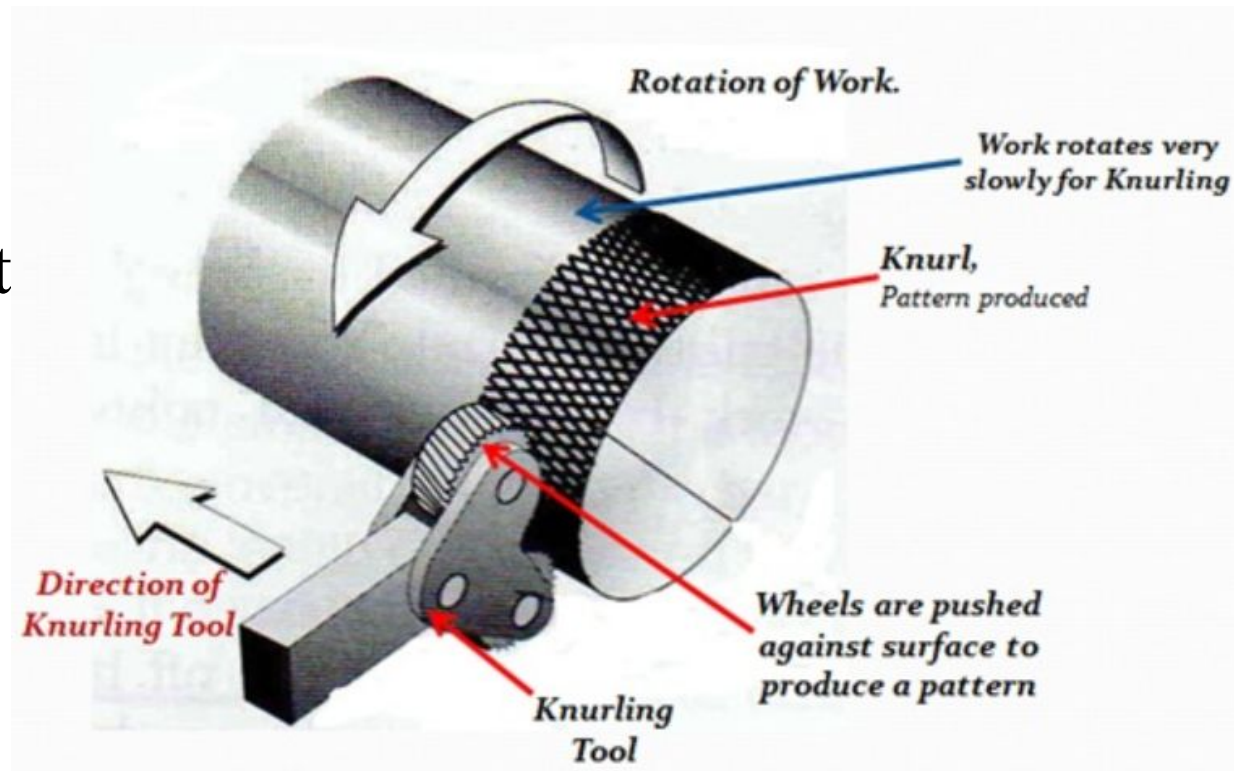
Cutting Parameters

- *Cutting feed*: The distance that the cutting tool or workpiece advances during one revolution of the spindle
- *Cutting speed* - The speed of the workpiece surface relative to the edge of the cutting tool during a cut
- *Feed rate* - The speed of the cutting tool's movement relative to the workpiece as the tool makes a cut
- *Axial depth of cut* - The depth of the tool along the axis of the workpiece as it makes a cut, as in a facing operation
- *Radial depth of cut* - The depth of the tool along the radius of the workpiece as it makes a cut, as in a turning or boring operation

Knurling Operation

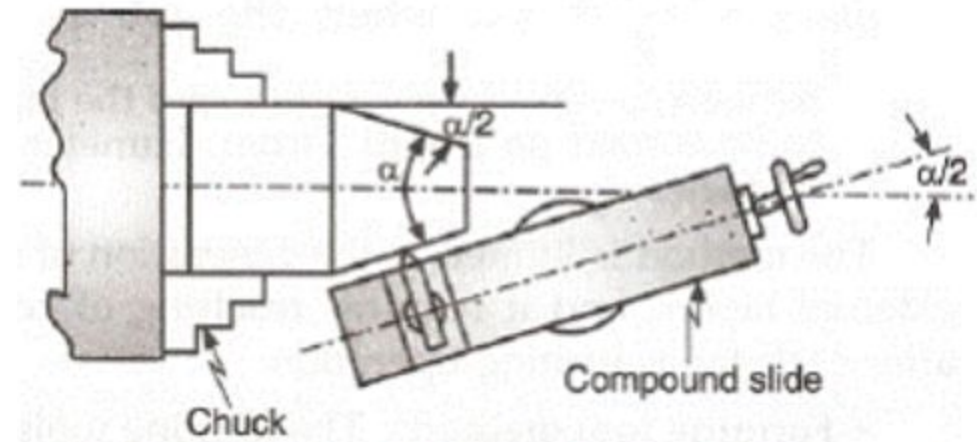
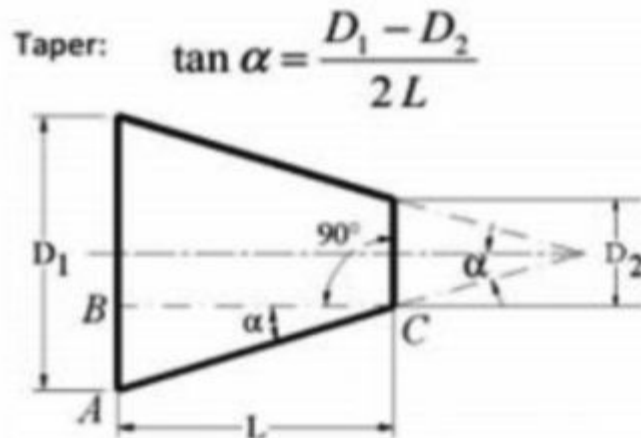
- **Knurling Operation:**

- It is the process of producing a rough surface on the workpiece to provide effective gripping.
- Knurling tool is held rigidly on the tool post and pressed against the rotating job so that leaving the exact facsimile of the tool on the surface of the job.



Taper Turning Operation

- **Taper turning:** A taper is defined as a uniform decrease in the diameter of a workpiece along with its length.
- The operation by which a conical surface of the gradual reduction in diameter from a cylindrical workpiece is produced is called taper turning



Taper Turning Operation

- A tapering form may be done by anyone of the following methods.

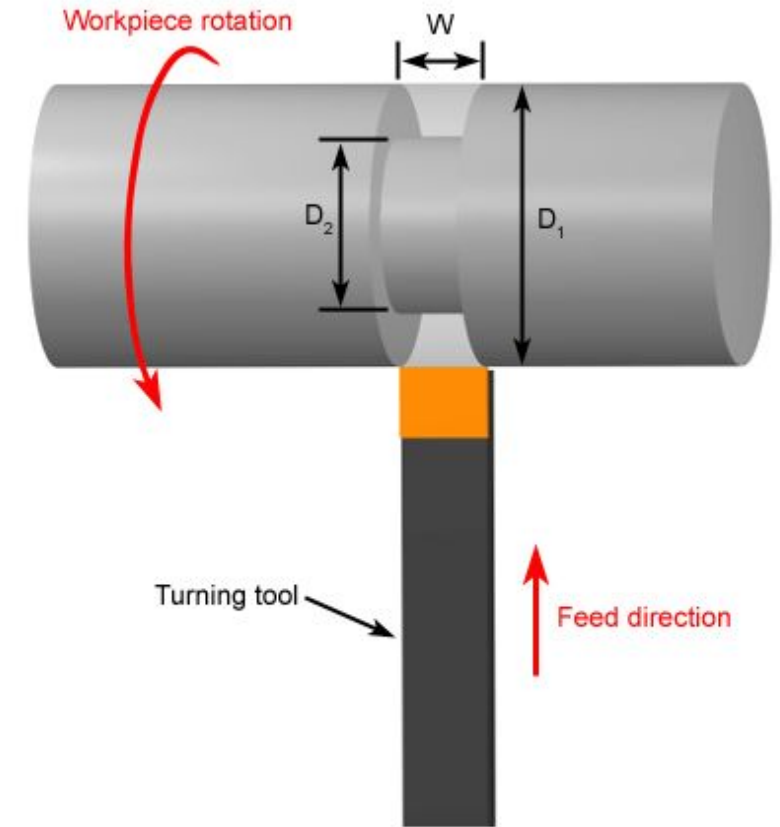
1. Taper turning by form tool
2. **By swiveling the compound rest**
3. Tail-stock set over method
4. By taper turning attachment

By swiveling the compound rest

- Set the compound rest by swiveling it from the centerline of the lathe center through an angle equal to a half taper angle.
- Clamp the carriage in place.
- After adjusting and setting the tool, feed is applied by the compound rest's feed handle to complete the taper.

Grooving Operation

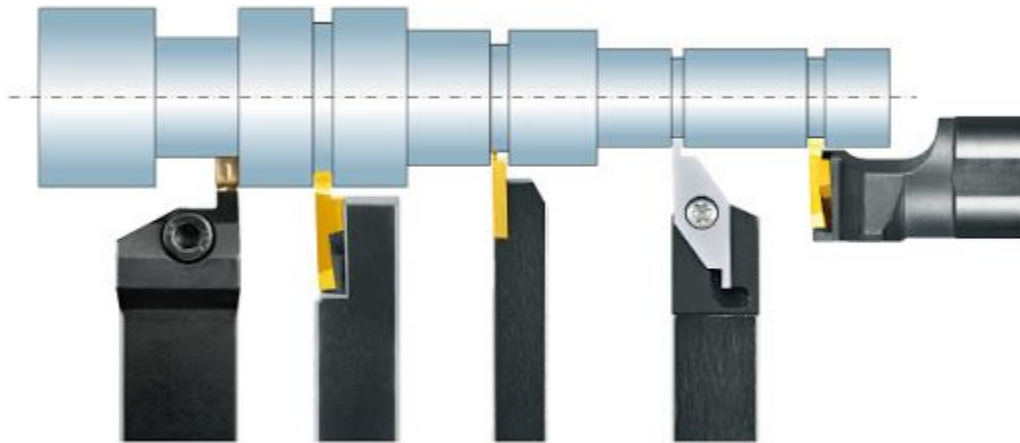
- What is Grooving operation?
- A single-point turning tool moves radially, into the side of the workpiece, cutting a groove equal in width to the cutting tool.
- Multiple cuts can be made to form grooves larger than the tool width and special form tools can be used to create grooves of varying geometries.



Copyright © 2007 CustomPartNet

Grooving Operation

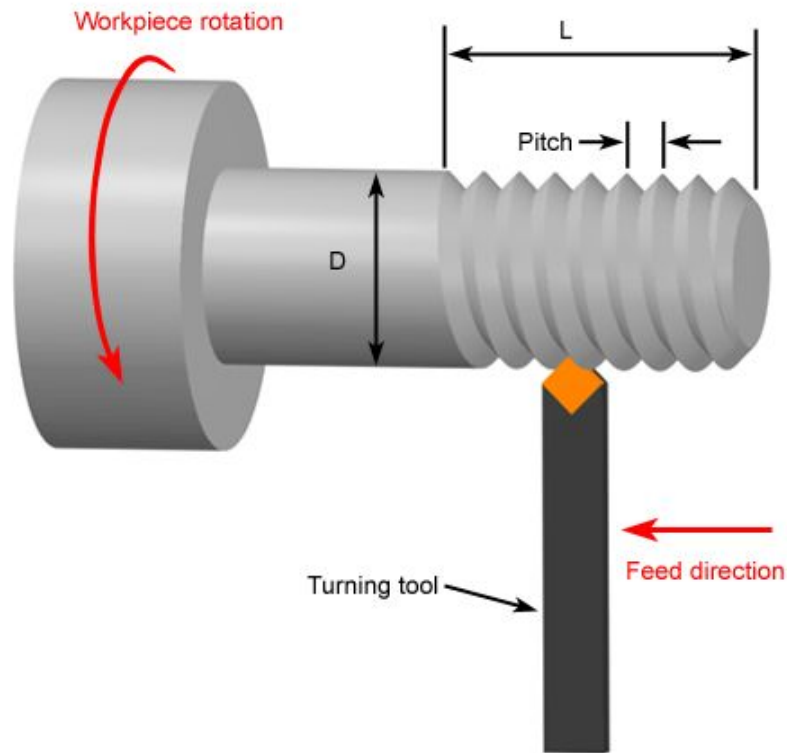
- What are the tools used?
 - Grooving tool - Grooving tool is usually a carbide insert mounted in a special tool holder, like any other tool. Designs of grooving inserts vary, from a single tip, to an insert with multiple tips.



Other Lathe Operations

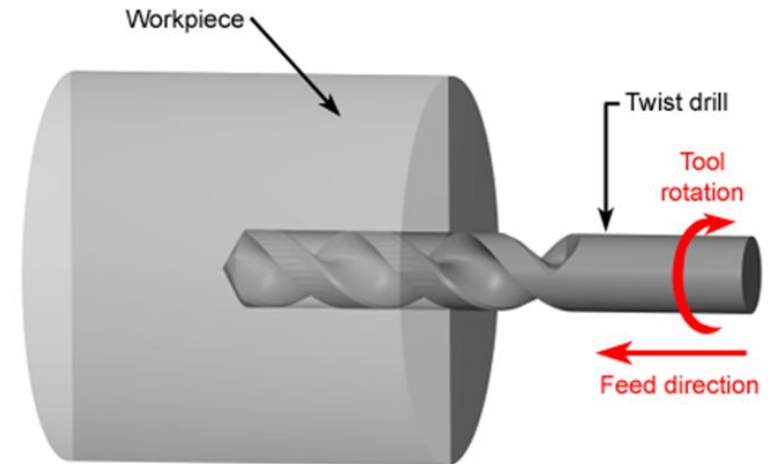
- Other important lathe operations include:

Thread cutting operation



Copyright © 2007 CustomPartNet

Drilling Operation

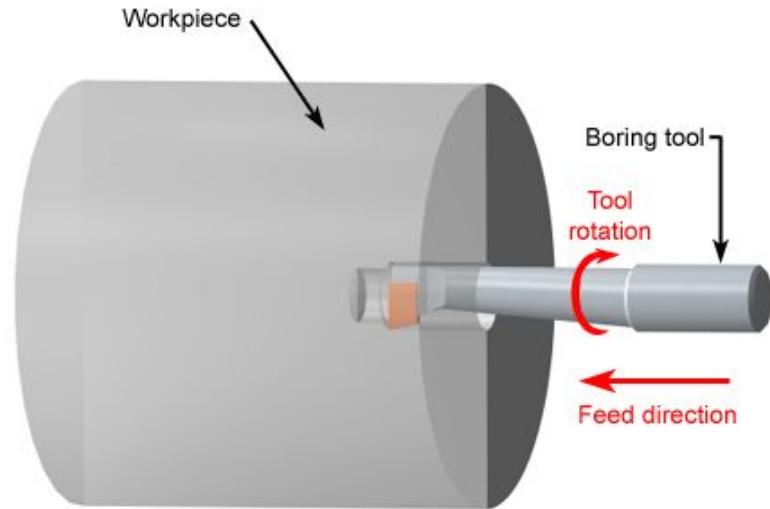


Copyright © 2007 CustomPartNet

Other Lathe Operations

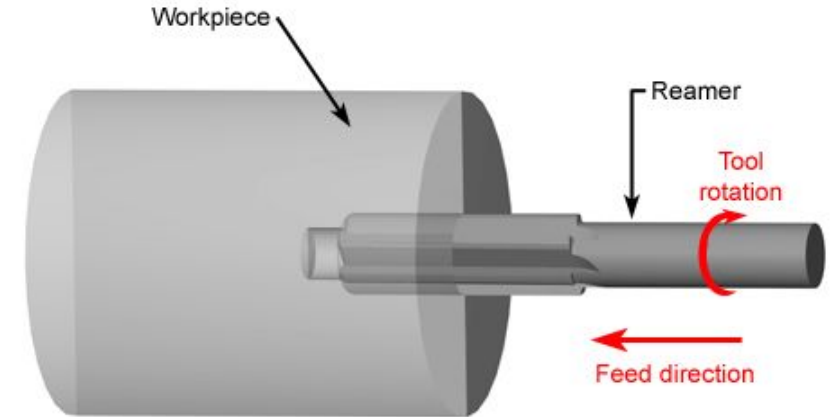
- Other important lathe operations include:

Boring Operation



Copyright © 2007 CustomPartNet

Reaming Operation

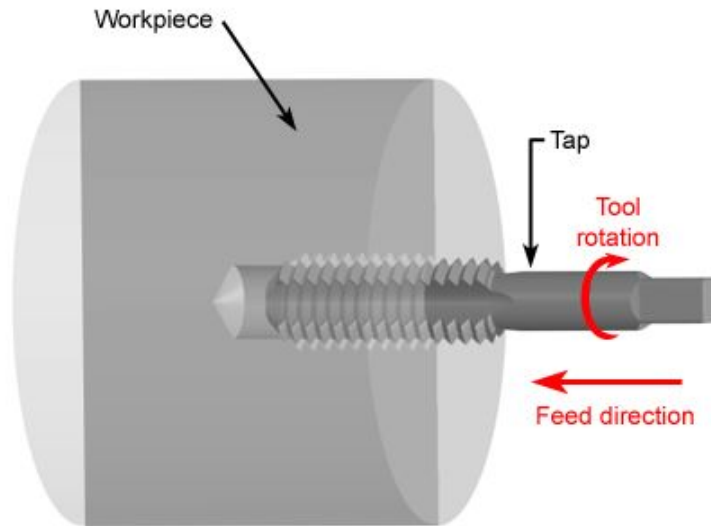


Copyright © 2007 CustomPartNet

Other Lathe Operations

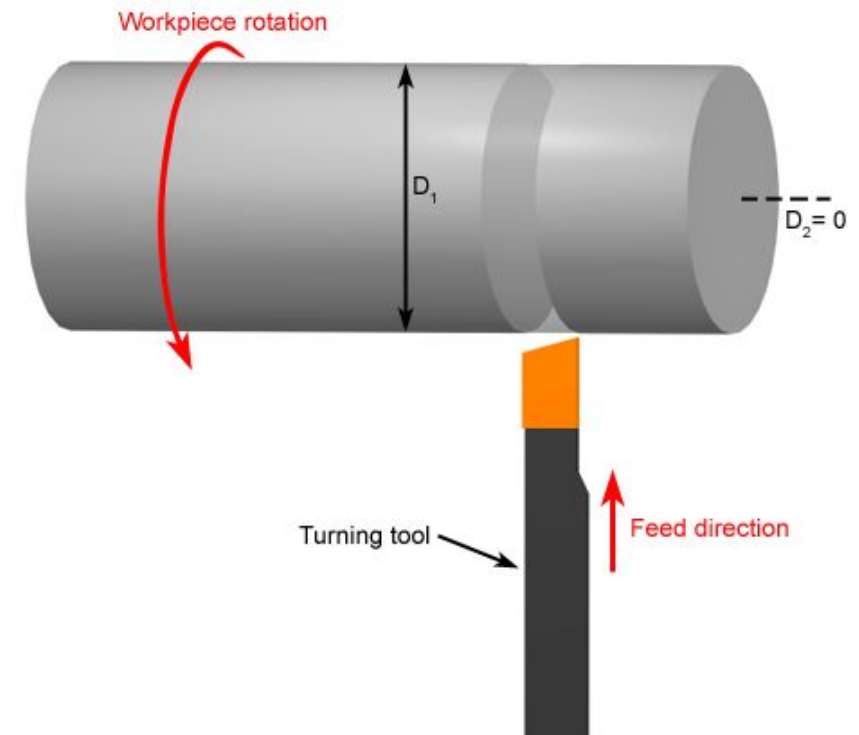
- Other important lathe operations include:

Tapping Operation



Copyright © 2007 CustomPartNet

Parting-off operation



Copyright © 2007 CustomPartNet

CNC Lathe

- **What is CNC Lathe Machine?**
- CNC stands for Computerized numerically controlled.
- This is widely used as a lathe in the present time because of its fast and accurate working. It is one of the most advanced types.
- It uses computer programs to control the machine tool. Once the program is fed into the computer as per the program it starts operation with very high speed and accuracy.
- Even do preplanned programmed machine is there in which once code is set for the various operations it can starts operation without changing code in the next time.
- These types of lathes are also used for mass production
- The components manufactured by these lathes are very accurate in
- dimensional tolerances.

CNC Lathe





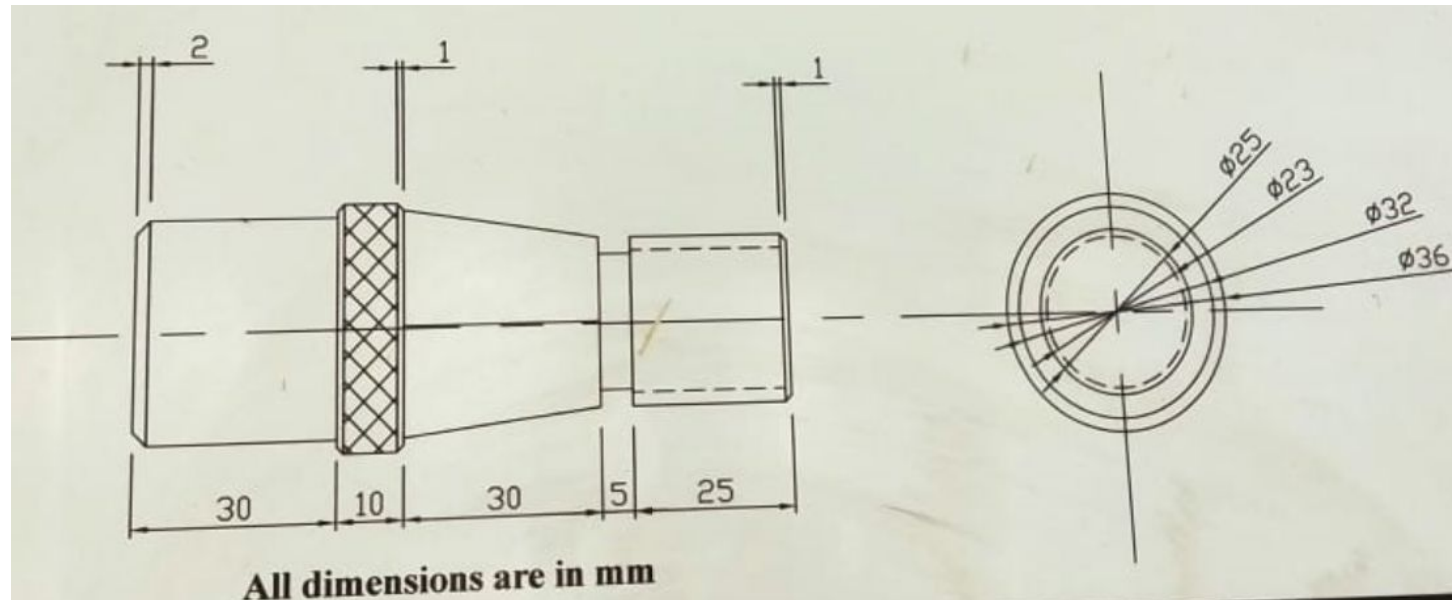
CNC

Concluding Remarks

- Summarize the learning points from this section

Task for Students

- Write the procedure to be followed for preparing the following multiple lathe operations Job
 - Highlight the operations involved
 - Tools used for each operation
 - Draw the diagram of the job



Quiz

- Faculties can give some instructions regarding quiz test
- The test should be conducted by MCQ test comprising of 10 questions
- Example:
 - Which of the following tool can be used to check the perpendicularity of two adjacent sides of a workpiece
 - a) Steel Rule
 - b) Try Square
 - c) Snip
 - d) Scriber

Assessment

Class Work [Write up of task] - To be conducted after end of each section	$10 \times 4 = 40$
Quiz - To be conducted after end of each section	$5 \times 4 = 20$
Daily Performance	$5 \times 4 = 20$
End Semester Test - To be conducted at end of semester	20
Total	100

Important Instructions for BMS Faculties

- In the first class [1st week only], faculties must give a brief introduction of BMS Lab
 - What are the different sections
 - What are the different machines we have in the BMS Lab
 - What the students will learn by end of this Lab class
 - Assessment procedure of BMS class
- Some contents can be added to the current ppt
 - If the faculty feels some more material can be added to this current PPT
 - All the faculties are suggested to go through the PPT files to get acquainted with the content
 - Any discrepancy in the content, kindly inform to the class coordinator [especially in the videos]

Important Instructions for BMS Faculties

- 3 classes can be considered for completing one section
- Out of which the **first two classes** can be reserved for completion of the **lecture-video PPT**
- The **last one** can be used for **assessment** of that section [Task write-up and Quiz test]
- It is being suggested to all faculties to use **Google Classroom** for the managing the BMS classes
 - Collection of Task write up [3rd class of each section]
 - Conducting Quiz [3rd class of each section]
 - Evaluation – Let the students know their marks after one week of completion