

# Computer Aided Manufacturing



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# Cleansing through Breathing

**Nadi Suddhi**  
(Alternate  
Nostril breathing)



**1 min**

# Recap and review of previous class

Let's  
Recap



5 mins

# Unit III

## PROGRAMMING OF CNC LATHE

Coordinate system - structure of a part program -G & M Codes - Programming for FANUC and SIEMENS controller -Single pass and canned cycle -Turning, facing and threading -Multi-pass canned cycle -Rough and Finish turning, facing, pattern repeating, grooving, threading, drilling, boring, peck drilling, high speed drilling cycle - Subprogram and Macro programming -Tool length and nose radius compensation - offset -Tool, work and coordinate -Insert -Materials, Classification, Nomenclature and Selection -**Tool and Work holding devices -Automatic tool changer -Turret and drum type -Tool holder nomenclature and selection -CNC part programming using CAD/CAM software and interfacing with CNC machines**

# Prerequisite Knowledge

- Various cutting tools
- Work holding devices

# 3.EVOCATION



## 4. GENERAL OBJECTIVE (GO)

➤ Students will be able to apply the skill to select the tool & work holding devices for the given component.

# 5. SPECIFIC OBJECTIVE (SO) MAPPED WITH STEM

The students will be able to

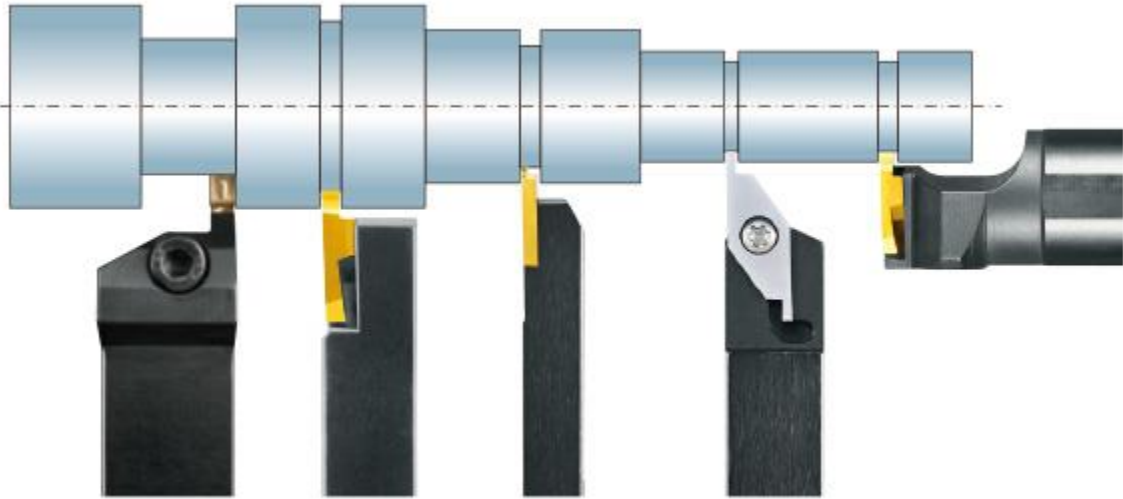
1. Illustrate the nomenclature and selection of tool holders for given application. (U-C) (E)
2. Explain the four types of work holding devices in CNC lathe. (U-C) (E)
3. Explain the part programming using CAD/CAM software and interfacing with CNC machines. (U-C) (E)
4. Find the suitable work and tool devices for the given application. (Ap-C) (E)



# TOOL HOLDING DEVICES

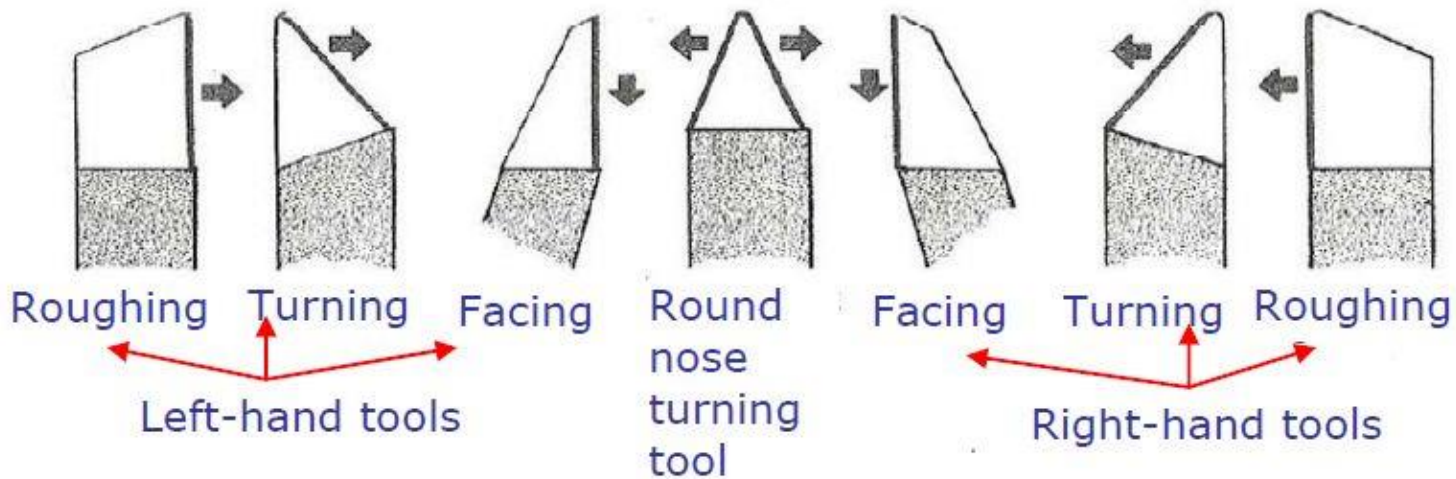
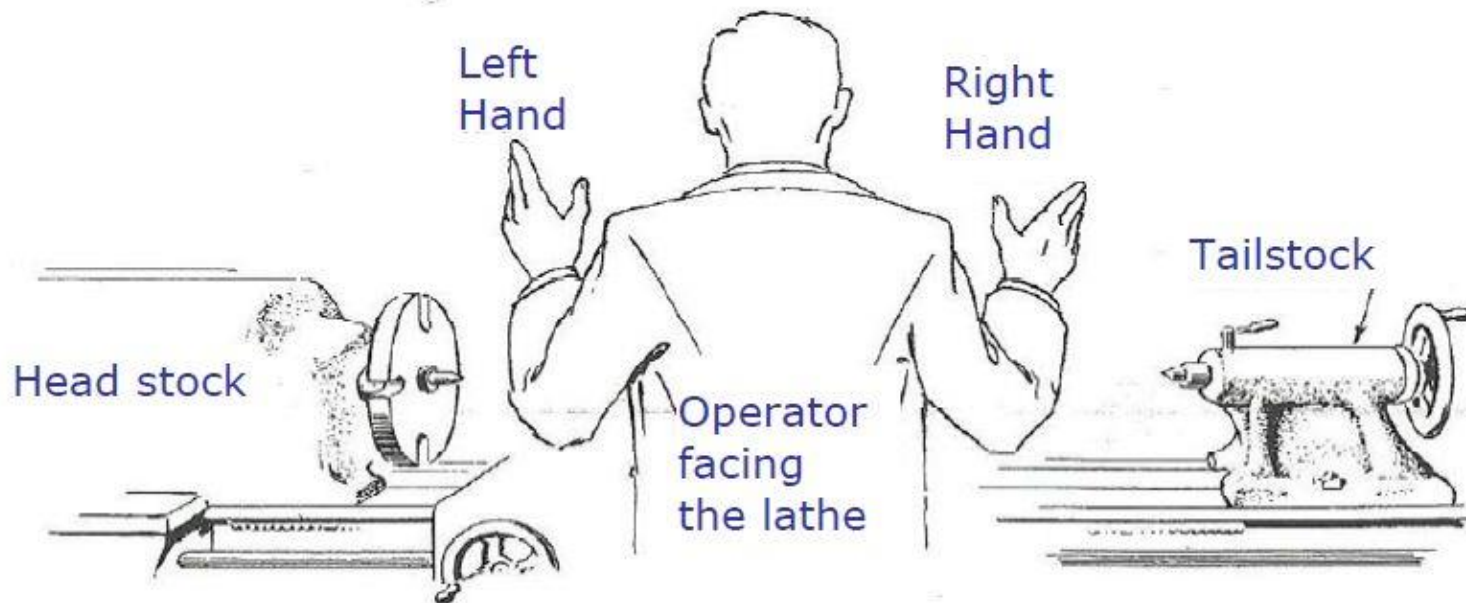
- Tool holding device – Tool Holders
- Turning tool holder – Left hand and right hand
- Facing
- Boring
- Grooving tool holder
- Threading tool holder

# Tool selection lathe



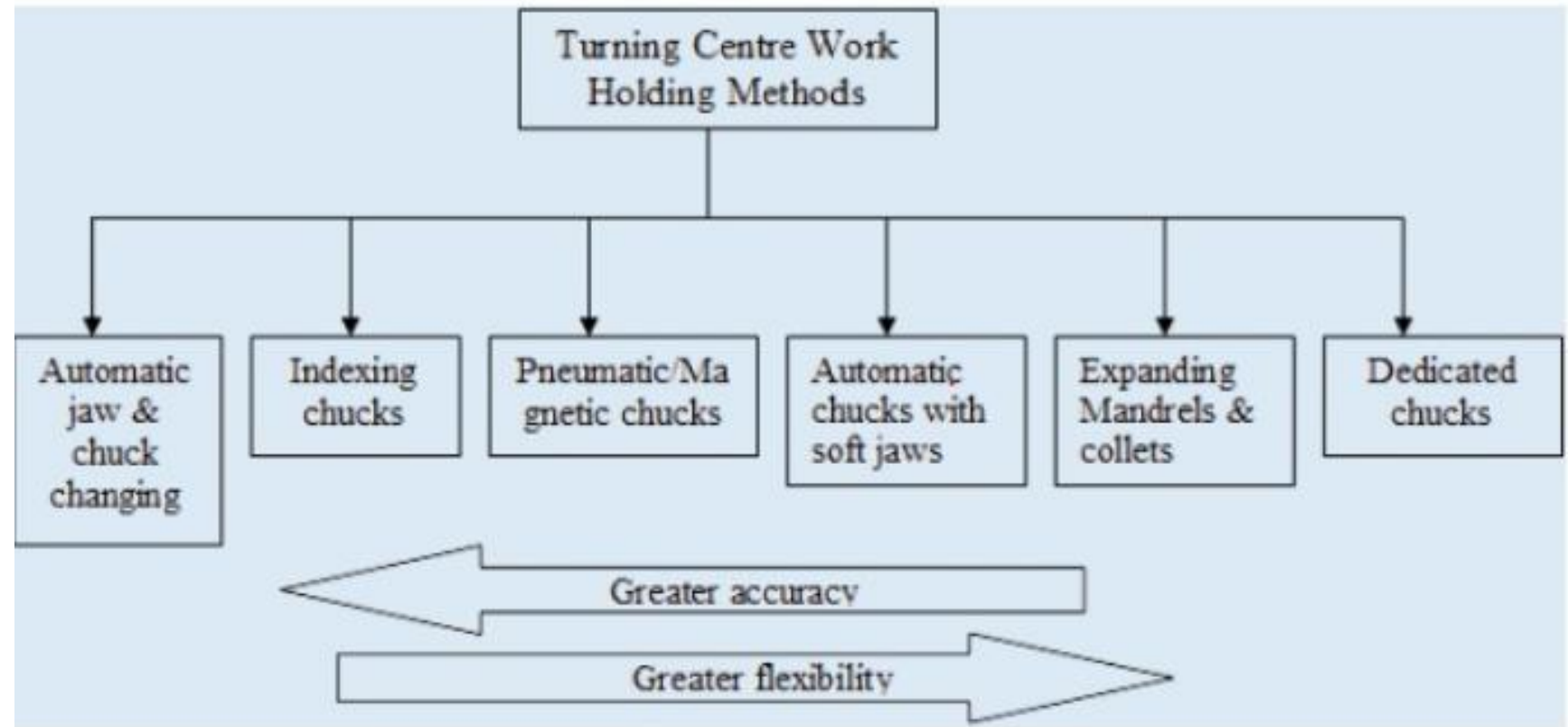
[cddmd.en.alibaba.com](http://cddmd.en.alibaba.com)

# Lathe machine cutting tools

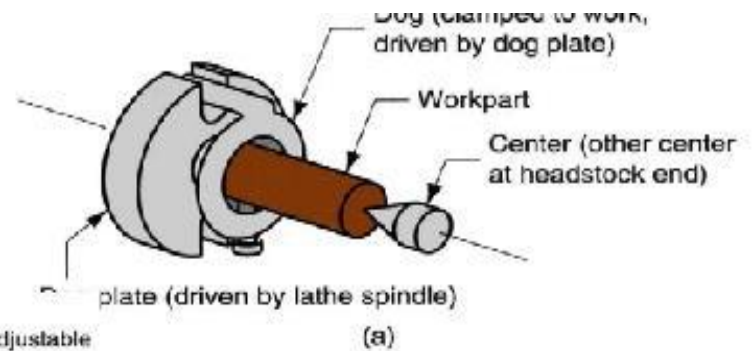


# WORK HOLDING DEVICES

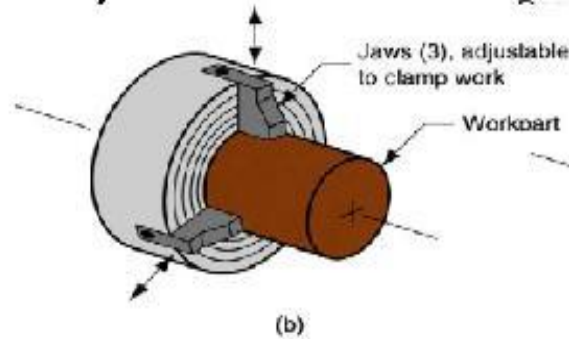
- Tool holders for indexable inserts are made from **steel** that's machined to the desired configuration and hardened to add strength, toughness, and rigidity.
- The **selection** of the tool holder **depends** almost entirely on the **insert chosen**, which is, in turn, determined by the machining operation to be carried out.
- The required feed, speed, depth of cut, and surface finish determines the type of insert. Once this is known, a tool holder design can be selected.
  - **Clamping Methods:**
    - Top clamping
    - Pin-lock clamping
    - Multiple clamping
    - Screw locks



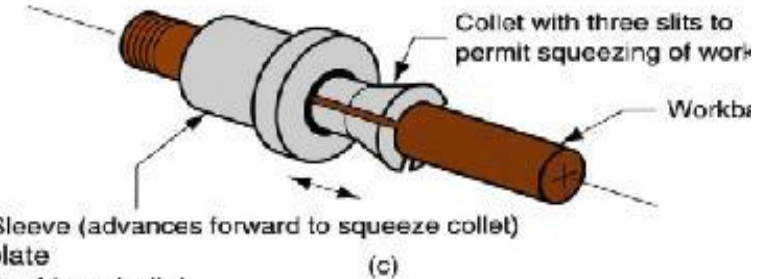
- Mounting between two centers (Dog & Live center)



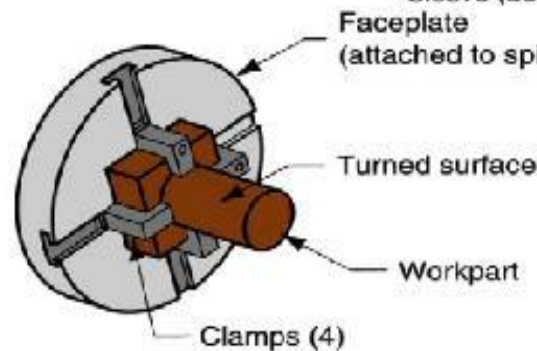
- Chuck



- Collet



- Face plate



# Designation of Tool holder

- **Style:**
- Tool holders are available with a wide **variety of shank styles**.
- The **shank** is the back portion of the bar, which attaches to the tool holder's mounting device.
- Shanks are available in various widths, thickness, and materials, and with different head configurations for locating the insert.
- Shanks can be **straight or offset**, and with different cutting edge angles (side or end) determined by the geometry of the insert pocket. ❓ Because of the wide variety of cutting operations and insert shapes, a standard for identifying tool holder
- styles has evolved that's similar to the insert identification system.
- A **tool holder identification system** for both internal and external tool holders can be used to precisely identify a tool holder for a specific machining operation.
- The **identification number** is a **10-position alphanumeric string** where each position is used to describe the feature of the tool holder. There are recognized



- A = Straight shank with 0° side cutting edge angle.
  - B = Straight shank with 15° side cutting edge angle.
  - C = Shank with 0° end cutting edge angle.
  - D = Straight shank with 45° side cutting edge angle.
  - E = Straight shank with 30° side cutting edge angle.
  - F = Offset shank with 0° end cutting edge angle.
  - G = Offset shank with 0° side cutting edge angle.
  - J = Offset shank with -3° side cutting edge angle.
  - K = Offset with 15° end cutting edge angle.
  - L = Offset shank with -5° end or side cutting edge angle.
  - M = Straight shank with 50° side cutting edge angle
  - O\* = Straight shank with centrally located round insert.
  - P = Straight shank with 27 1/2 ° side cutting edge angle.
  - Q = Offset shank with -17 1/2° cutting edge angle.
  - R = Offset shank with 15° side cutting edge angle.
  - S = Offset shank with 45° side cutting edge angle.
  - T\* = Offset shank with -30° side or end cutting edge angle.
  - V = Straight shank with 17 1/2° side cutting edge angle.
  - W = Offset shank with 10° side cutting edge angle.
- Toolholder Style**

- C = Clamp lock assembly (PC toolholders)
  - M = Multiple lock assembly (Pin and clamp lock) (M-Type toolholders)
  - P = Pin lock assembly (NL/PL toolholders)
  - S = Screw lock
  - T\* = Taper stem (Tee-lock toolholders)
- Method of Holding**

- L = Left
  - N = Neutral
  - R = Right
- Hand of Tool**

For square shanks, the number represents the number of sixteenths of width and height.  
For rectangular shanks, the first digit represents the number of eighths of width and the second digit represents the number of quarters of height.

**Toolholder Shank Size**

- A = Qualified back and end. 4" long.
  - B = Qualified back and end. 4.5" long.
  - C = Qualified back and end. 5" long.
  - D = Qualified back and end. 6" long.
  - E = Qualified back and end. 7" long.
  - F = Qualified back and end. 8" long.
  - J = Qualified back and end. 3.5" long.
  - M = Qualified front and end. 4" long.
  - N = Qualified front and end. 4.5" long.
  - P = Qualified front and end. 5" long.
  - R = Qualified front and end. 6" long.
  - S = Qualified front and end. 7" long.
  - T = Qualified front and end. 8" long.
- Qualified Surface & Length**

**M T F N R [ ] - 16 4 D**

- Insert Shape**
- C = 80° Diamond
  - D = 55° Diamond
  - R = Round
  - S = Square
  - T = Triangle
  - V = 35° Diamond
  - W = Trigon

- Rake Attitude**
- N = Negative
  - O = Neutral
  - P = Positive
  - C = Neutral - accepts 7° clearance inserts.
  - B = Neutral - accepts 5° clearance inserts.

- Pocket Style**
- S = Single wall pocket construction. Full pocket construction when letter position is vacant.

**Insert Size I.C.**  
Number of eighths of I.C.

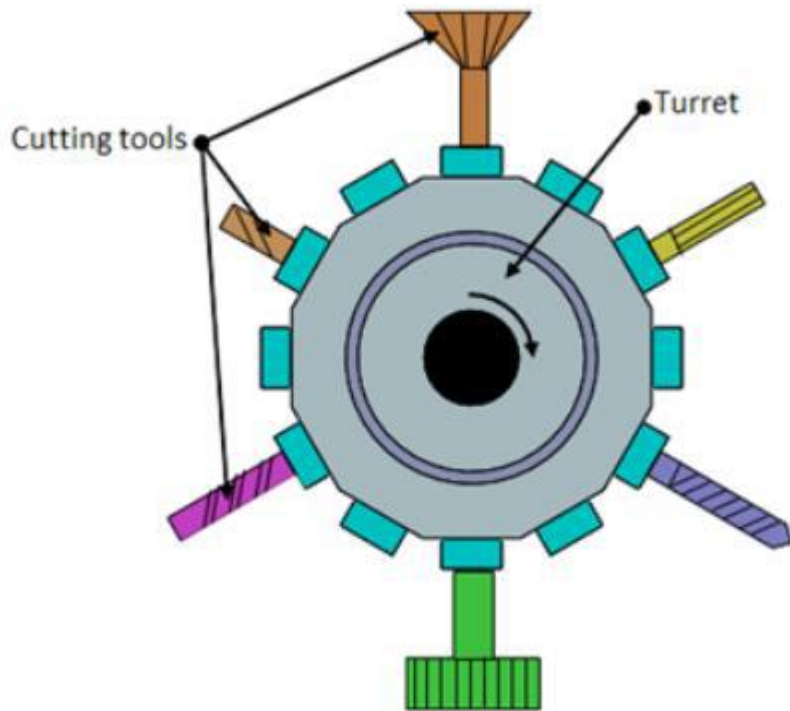
\* Carbology Standard



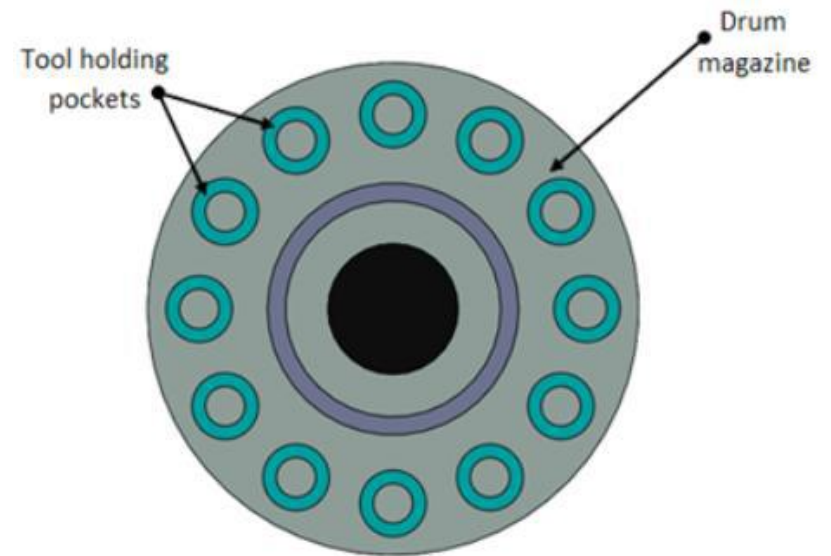
# AUTOMATIC TOOL CHANGER (ATC)

- **Types of ATC:**
- **1. TURRET TYPE**
- **2. DISC or DRUM TYPE**
- **3. Spindle Direct (out Of Syllabus)**

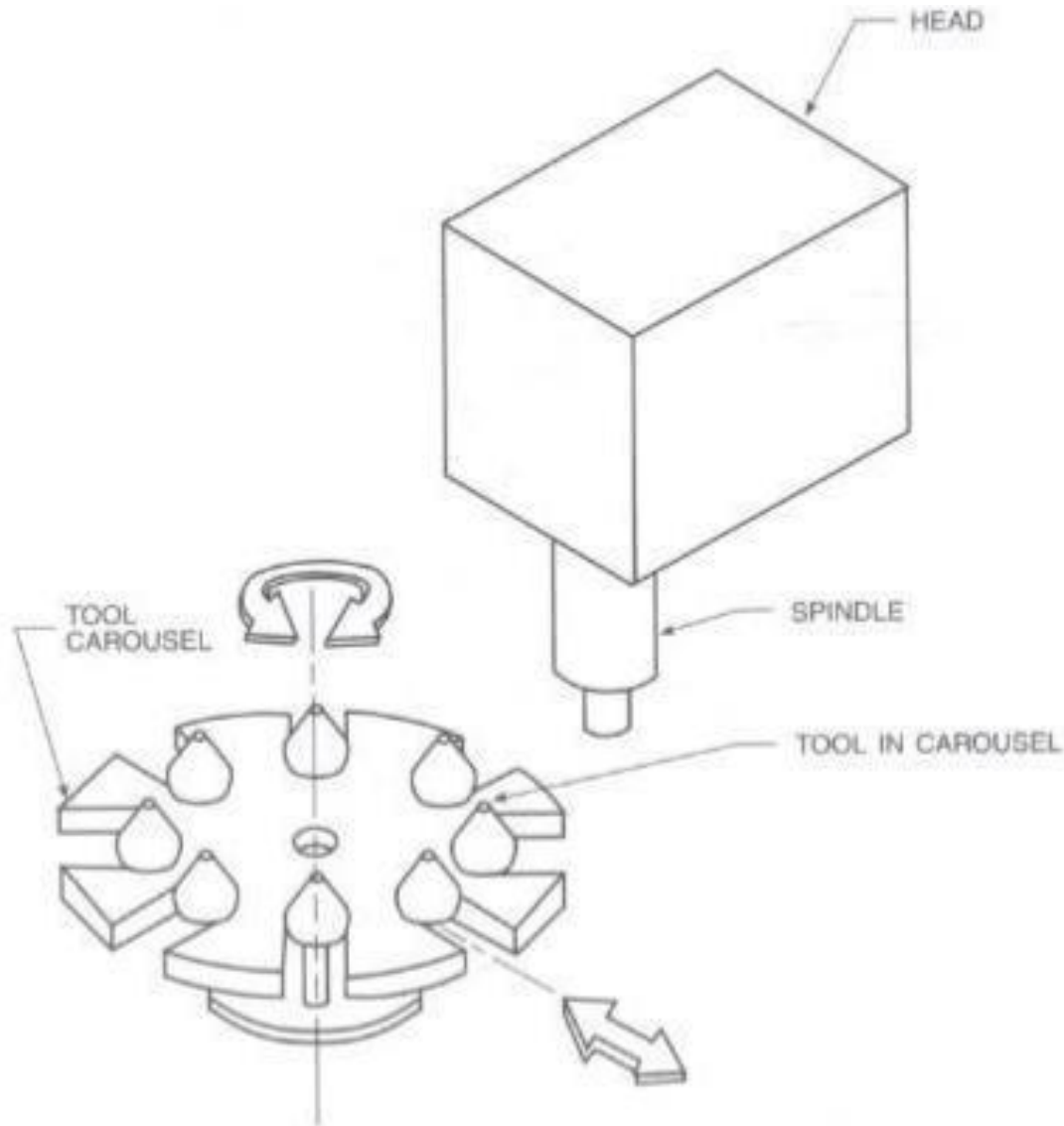
## TURRET TYPE



## DISC OR DRUM TYPE



# Spindle Direct (out Of Syllabus)



# **CNC PART PROGRAMMING USING CAD/CAM AND INTERFACING WITH CNC MACHINES**

# CNC PART PROGRAMMING USING CAD/CAM AND INTERFACING WITH CNC MACHINES

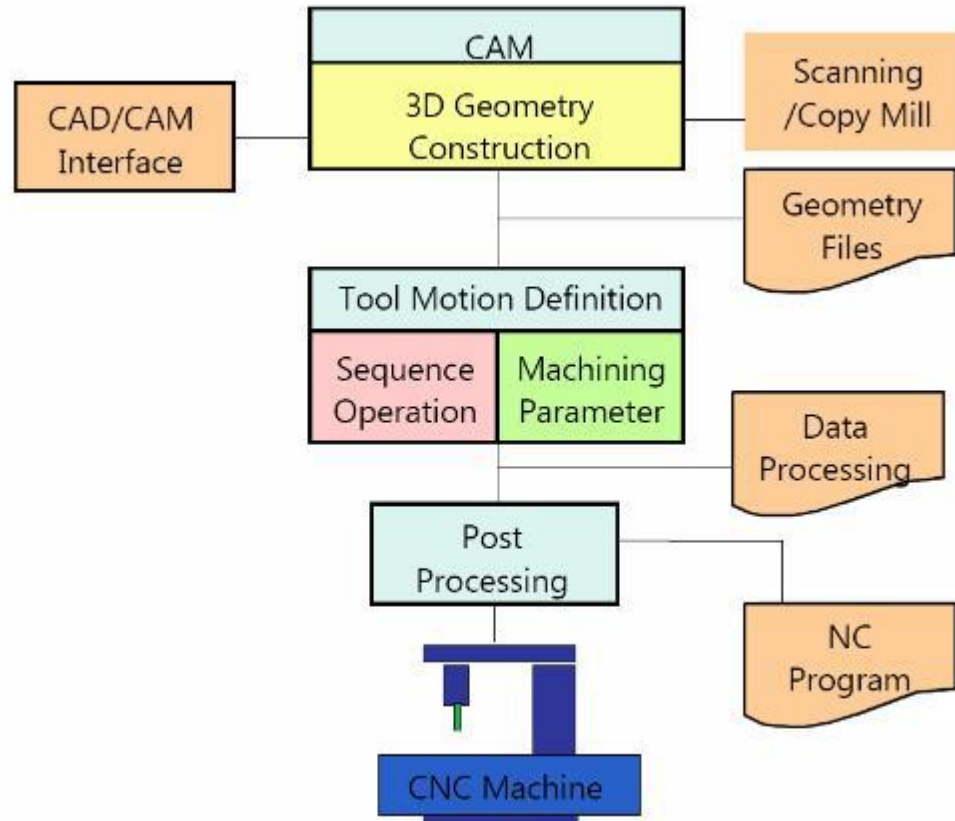
- In manual programming, **all calculations are done by hand**, with the aid of a pocket calculator – no computer programming is used.
- •Programmed data can be transferred to CNC machines using a **memory card or via a cable**, using an **inexpensive desktop or a laptop computer**.

# PART COMPLEXITY

- **Difficult or complex jobs** will benefit from a computerized programming system.
- Technologies such as Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) have been a strong part of the manufacturing process for many years.
- The cost of a CAD/CAM system is only a fraction of what it used to be only a few years ago.
- A typical example of this kind of application is the very popular and powerful **Mastercam™** or **EdgeCam**.

# Part programming using CAD/CAM

- Define the work part geometry.
- Defining the repetition work.
- Specifying the operation sequence



# Post Processor

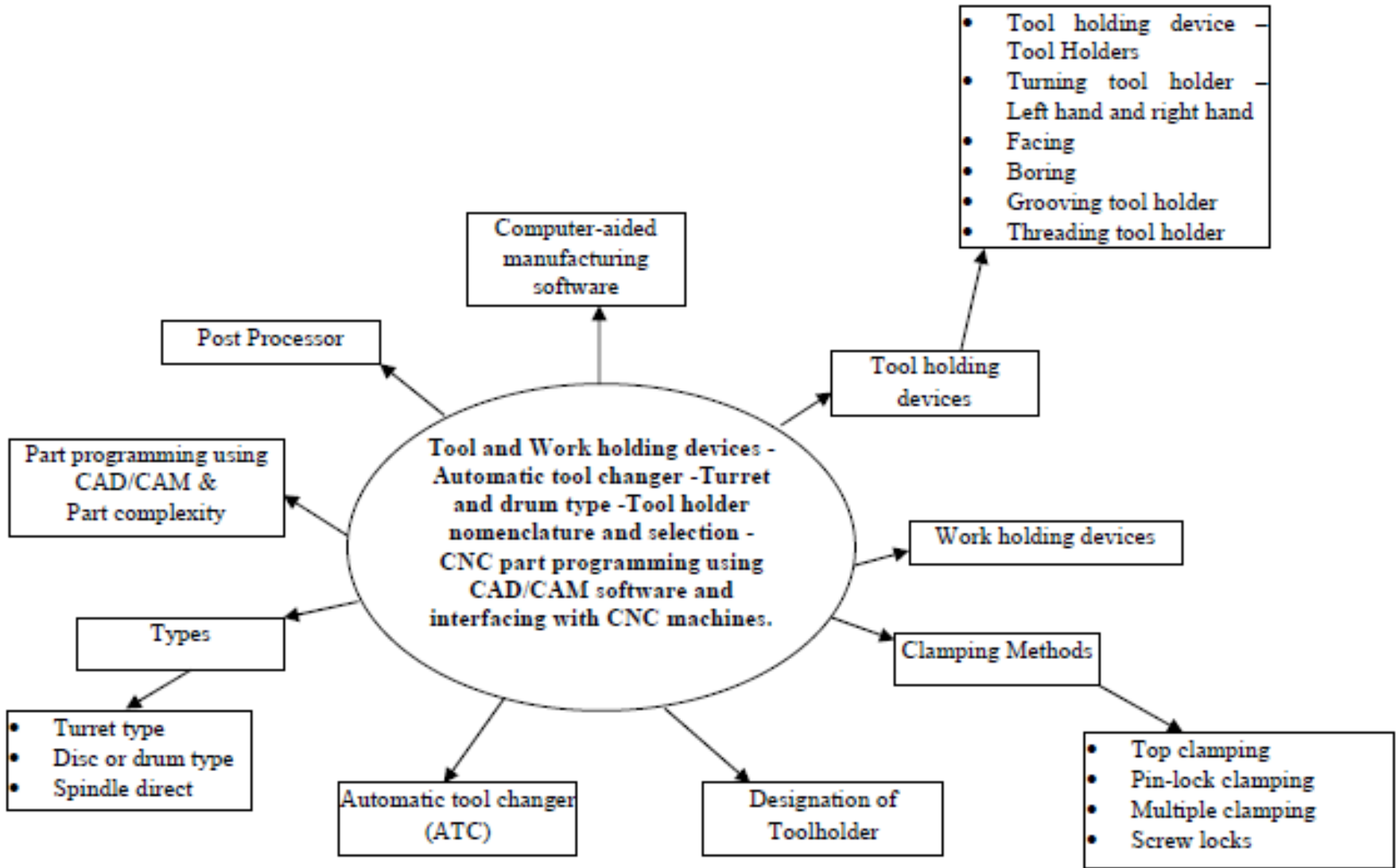
- Controls the format and syntax of the program that is generated for the controller that controls a specific machine.
- Post processor is used with the CAM (Computer Aided Manufacturing) Software to generate G-code for a specific CNC Machine



# Computer-aided manufacturing software

- CADEM
- Edge CAM
- Delcam
- Master cam
- CATIA
- NC-CAM
- Siemens NX
- MazaCAM
- Machining STRATEGIST
- MaterialCenter
- Model-based definition
- MPDS4
- MSC Marc
- MSC Software
- Autodesk Fusion 360

# CONCEPT MAP



# Discussion



<https://www.youtube.com/c/CNCTRAININGTAMILNADU/featured>

10 mins