SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution
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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF MECHATRONICS ENGINEERING

UNIT IV – CNC PROGRAMMING

COORDINATE SYSTEM & STRUCTURE OF A PART PROGRAM

COORDINATE SYSTEM

1.Machine Coordinates:

1. The CNC machine has its own coordinate system, often called the machine coordinates. It represents the physical dimensions of the machine.

2.Work Coordinates:

1. The work coordinates define the position of the part in relation to the machine. This system is set based on the part's dimensions and location on the machine table.

3.Origin:

1. Establish a reference point (origin) for your part. It's a common practice to set the origin at one of the corners of the part or at the center, depending on your preference and the machining requirements.

4.Axis Orientation:

1. Understand the orientation of the machine's axes (X, Y, and Z). Usually, X is horizontal, Y is vertical, and Z is the depth.

- **Tool Selection:**

  Choose the appropriate cutting tools based on the part's geometry and material.

- **Tool Paths:**

  Plan the tool paths that the CNC machine will follow to create the part. Consider the order of operations and the sequence of cuts.

- **G-code Commands:**

  Use G-code commands to control the machine. Common commands include G00 (rapid positioning), G01 (linear interpolation/movement), G02/G03 (circular interpolation), M03/M04 (spindle on/off), M05 (spindle stop), etc.

- **Programming Blocks:**

  Organize your program into blocks. Each block typically contains one or more G-code commands. Use line numbers to help with program navigation and troubleshooting.

STRUCTURE OF A PART PROGRAM

- **Feed Rates and Speeds:**

  Specify feed rates (how fast the tool moves through material) and spindle speeds based on the material being cut and the tool being used.

- **Tool Offsets:**

  Consider tool offsets to compensate for the tool's physical dimensions. These offsets ensure the tool cuts precisely where it's supposed to.

- **Coolant and Lubrication:**

  Include commands for coolant and lubrication if needed. This is crucial to prevent overheating and extend tool life.

- **Safety Precautions:**

  Add safety measures, such as retracting the tool to a safe height between operations, to avoid collisions.

STRUCTURE OF A PART PROGRAM

N10 G90 G54   ; Absolute coordinates, work coordinate system G54

N20 G00 X0 Y0 Z0 ; Rapid positioning to the starting point

N30 M03 S500   ; Start spindle at 500 RPM

N40 G01 X10 Y5 Z-2 F100 ; Linear cut to point (10, 5, -2) at a feed rate of 100 units/minute

N50 G02 X15 Y10 I2 J3   ; Circular cut with a radius of 2 units, center at (15, 10)

N60 M05   ; Stop spindle

N70 G00 Z5   ; Rapid retract to Z5

N80 M30   ; End of program