

# MAC 121 Introduction to CNC

## COURSE DESCRIPTION:

Prerequisites: None

Corequisites: None

This course introduces the concepts and capabilities of computer numerical control machine tools. Topics include setup, operation, and basic applications. Upon completion, students should be able to explain operator safety, machine protection, data input, program preparation, and program storage.

Course Hours Per Week: Class, 2. Semester Hours Credit, 2.

## LEARNING OUTCOMES:

Upon completion of this course, the student will be able to:

- a. Understand the basic procedures and concepts of programming, set up and operation of a CNC Machining Center.
- b. Identify and understand the basic programming codes.
- c. Create geometry and toolpaths from the specifications on a blueprint for simple parts using Mastercam programming software.
- d. Identify and define the functions of the CNC machine control.
- e. Set up the CNC machining center for manufacturing simple parts
- f. Manufacture simple parts on the CNC machining center.

## OUTLINE OF INSTRUCTION:

- I. Introduction
  - B. Definition
    1. Numerical control
    2. Computer numerical control
  - C. Historical perspective
    1. Need for CNC machines
    2. Early machines (NC)
    3. Future of CNC
  - D. Types of CNC machine control
    1. Absolute dimensioning system
    2. Incremental dimensioning system
    3. Contour machines (continuous path)
  - E. Use of cartesian coordinate system
  - F. Types of CNC machines

- II. Basic principles of computer numerical control
  - A. Programming terms and procedures
  - B. Machine tool co-ordinate system
    - 1. Lathe
    - 2. Milling machine
  - C. Manual Data Input
  - D. Code generation and description (G and M codes)
  - E. Saving a program to a flash drive
  - F. Posting a program
  - G. Transmitting a program to the CNC machine control

- III. Machine operations

- A. Milling machine setup and operations
  - 1. Hand jog operations
  - 2. Manual data input for spindle speed and correct rotation
  - 3. Edge Finding
  - 4. Establishing the origin point (G54)
  - 5. Set tools in tool holders
  - 6. Load tool holders in the correct position in the tool carousel
  - 7. Set tool length offsets
  - 8. Operate CNC Machining Center to manufacture a simple part

**REQUIRED TEXTBOOK AND MATERIAL:**

Students will need a basic calculator, a flash drive (minimum 2 GB) and safety glasses.