Course Information Form (CIF)

Course Code: MFT 137

Course Title: Introduction to CNC Programming

Department: Applied Sciences and Technologies
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 48.051
Repeatability: 0

Effective Date: Summer 2026

Credit Hours

Catalog Notation: 4-0-4
Credit Hour Distribution:

Lecture: 4	Lab: 0	Clinical: 0	**Total: 4**

General Course Information

Catalog Description

Introduction to computer numerical control (CNC) and programming CNC machines. Emphasis on fundamentals of CNC lathe and mill operations and good programming practices.

General Course Objectives

Students will develop an understanding of how CNC works and where it fits into the system of automated manufacturing. Students will learn the strengths and weaknesses of CNC machining. A vocabulary will be developed so the right questions can be asked and their answers understood by someone using a CNC machine. Organizational and conceptual skills will be developed to take a shop drawing and create a logical, safe, and efficient set of instructions for a CNC machine to produce the specified part.

Minimum Placement Levels

English	Reading	Math
None	None	None

Prerequisites

Credit in MFT 130 or equivalent

Methods of Evaluation

Students will be given 2 one-hour exams, 4 quizzes, 1 final exam, and 4 projects.

Instructional Materials and Additional Supplies

Provided through HAAS Automation

Course Content

General Learning Outcomes (GLOs)

- Reasoning and Inquiry: Students will demonstrate the ability to solve problems using deductive reasoning and logic, quantitative reasoning, or the scientific method.
- Technology: Students will demonstrate the ability to evaluate, select, and appropriately use current and emerging tools.

Course Segments and Student Learning Outcomes

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
CNC Overview and Perspective	1. Explain the basic flow chart of how CNC operates, the advantages and disadvantages of CNC, and the historical perspective of CNC development.	2	0	0
Dimensioning Theory: Absolute Dimensioning and Incremental Dimensioning	1. Differentiate between absolute and incremental dimensioning, how to convert from one to the other, and how to make an intelligent choice of the zero point in an absolute system.	1	0	0
Cartesian Coordinates in Two Dimensions, Cartesian Coordinates in Three Dimensions, and Machine Axis Conventions	1. Use the Cartesian coordinate system absolute/incremental dimensioning to describe parts to be produced using CNC. 2. Demonstrate conventions in assigning machine axes to the system axes.	4	0	0
Manual Operation of CNC Machinery: Mill Operation and Lathe Operation	1. Demonstrate how to manually operate a CNC mill and lathe. 2. Practice basic machine commands and how to think of machine movements in terms of Cartesian coordinates.	4	0	0
Standard G and M Code Programming and Canned Cycles	1. Program g-codes and the variables associated with them. 2. Demonstrate the use of canned cycles.	6	0	0
Proper Feeds, Speeds, and Chip Loads Using Calculations and Tables	1. Select and calculate proper feed and cutter chip loads for different cutters and materials using formulas and tables.	4	0	0
Tool Path Programming (Contouring): Linear Interpolation, Circular Interpolation, and Helical Interpolation	1. Use tool path programming. 2. Program simple parts using both linear and circular interpolation.	5	0	0
Subroutines and Associated Cycles: Formats for Subroutines and Nesting of Loops	1. Increase programming efficiency through the proper use of subroutines and nesting with emphasis shifting to reuse of blocks of code. 2. Summarize patterns in work pieces that lend themselves to these techniques.	7	0	0
Total Length Offsets: Setting TLO on Mill and Setting TLO on Lathe	1. Program tool length offset on the lathe and mill, and understand tooling factors associated with this.	3	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Linear Interpolation Cycles: Rough Turning Cycle, Face Turning Cycle, Grooving Cycle, and Frame Milling Cycle	1. Use various canned cycles to shorten programming time on programs requiring repetitive linear interpolation.	3	0	0
Circular Interpolation Cycles: Circular Pocket Milling and Hole Milling Cycle	1. Use canned cycles to shorten circular interpolation programs.	4	0	0
Polar Coordinates: Moves with Spindle at Center, Moves with Spindle Location Specified, and Polar Rotation	1. Use polar coordinates and polar rotation to simplify programming of parts with circular patterns.	4	0	0
Cutter Compensation: Tool Radius Definitions, Setting and Using Radius Compensation	1. Use cutter compensation programming to account for different tool diameters and shapes.	5	0	0
Programming Threading Operations On Lathe and Longitudinal Plunge Threading	1. Program lathe for threading operations.	6	0	0
Methods of Storing Programs: Punched Tape, Magnetic Tape, Diskette, and Computer Memory	1. State the characteristics, limitations, and advantages of the different types of storage media to store a completed program. 2. Store the completed program using several methods.	2	0	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
60	0	0