Course Information Form (CIF)

Course Code: MFT 238

Course Title: Advanced CNC Programming

Department: Applied Sciences and Technologies
PCS Code: 1.2 - Occupational/Technical Instruction
CIP Code: 15.0499
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

Advanced computer numerical control (CNC) three- and four-axis programming and operation; setup and operation of industrial CNC turning center and vertical machining center.

General Course Objectives

This course will develop understanding in the application of three- and four-axis CNC programming. The student will develop an understanding of advanced terms and conventions of Computer Numerical Control programming, setup, and operation. This course will familiarize the student with operational characteristics and features of industrial CNC equipment.

Minimum Placement Levels

English	Reading	Math
Placement into ENG 098	Placement into CCS 098	Placement into MAT 059

Prerequisites

Credit in MFT 138

Methods of Evaluation

Students will be given (advanced level) 2 CNC programming exams - 1 turning, 1 milling; 8 CNC programming chapter exercises; 2 CNC programming projects; and 1 final CNC programming project.

Instructional Materials and Additional Supplies

MasterCAM software tutorials, online and textbook resources through Caminstructor.com

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
Overview of CNC Terms and Conventions from Prerequisite Course and the Transition to Advanced CNC Programming	1. Identify how certain prerequisite introductory materials will be applied to advanced CNC programming.	2	0	0
Three-axis Turning System, Four-axis Milling, Axis Conventions; Machine Zero, Home Zero, and Program Zero	1. Describe three-axis programming as it applies to CNC turning and four-axis CNC milling.	5	0	0
Familiarization with Program Format, Canned Cycles, Setup Procedures, and Modes of Operation	1. Describe how to access modes on the HAAS VF-E CNC vertical machining center (referred to as VF-E) and the HAAS HL-2 CNC Turning Center (referred to as HL-2). 2. Describe proper program format, use of canned cycles, and setup procedures.	5	0	0
Part Program Storage and Retrieval, Input/Output Functions, and Program Edit Features	1. Practice various storage methods and be able to output or input CNC program files as well as use the program edit functions.	2	0	0
Preparatory Functions (G codes), Machine Functions (M codes), and Subroutines	1. Identify various G codes and M codes and their parameters, and apply these to the use of subroutines in order to increase programming speed and efficiency.	6	0	0
Spindle Speed Functions, Tool Functions, and Tool Radius Compensation Programming	1. Explain the control of the spindle for tapping and using forward and reverse, and specify tool nose radius information to control wear, length offsets, and other functions.	5	0	0
Work Coordinate Systems and Offsets, Dry Run Operation, and Display Screens	1. Calculate work shift and offsets as applied to geometry and tool wear. 2. Demonstrate proficiency in navigating and using various display options.	4	0	0

Course Segment	Learning Outcomes	Lecture Hours	Lab Hours	Clinical Hours
Feed Rate, Rapid Traverse Rate, and Spindle Speed Overrides; Alarms and Error Codes.	1. Describe proper application, use, and limits of overrides for feed rates, rapid traverse rate, and spindle speed.	4	0	0
Machine Parameters, Settings, and Tool Changer Operation	1. Describe various machine parameters and settings which may be appropriately reconfigured, including proper loading, indexing, and the use of a tool changing turret.	4	0	0
Auxiliary Axis Control; Automatic Acceleration and Deceleration Capabilities	1. Describe calibration, setup, programming, and operational procedures of the fourth axis on the VF-E to achieve rotary axis part geometry. 2. Comprehend the functions which affect the acceleration or deceleration of the cutting tool while in motion.	7	0	0
Application of Above Concepts for Completion of Portfolio of CNC programs and the Resulting Part	1. Prepare, set up, program, and execute CNC programs to produce parts which conform to specifications. 2. Write several CNC programs involving machine functions, programming/edit functions, setup procedures, and operational characteristics.	16	0	0

Total Contact Hours

Lecture Hours	Lab Hours	Clinical Hours
60	0	0