

# MACH A148: ADVANCED MULTI AXIS PROGRAMMING & MACHINING

Item	Value
Curriculum Committee Approval Date	02/22/2023
Top Code	095630 - Machining and Machine Tools
Units	5 Total Units
Hours	162 Total Hours (Lecture Hours 54; Lab Hours 108)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Open Entry/Open Exit	No
Grading Policy	Standard Letter (S)

## Course Description

In this course, students will learn how to program complex parts, create advanced setups and run the parts on 5-axis CNC Mills. AutoDesk Fusion 360 will be explored to create the G-code needed to run the parts on the machines. ADVISORY: MACH A125, MACH A126, and MACH A130. Transfer Credit: CSU.

## Course Level Student Learning Outcome(s)

1. Use the machine to prove out a program without first making the part.
2. Produce basic and complex parts on the CNC 5 axis Mills.
3. Demonstrate the process of loading programs from a computer to the memory of the machines.

## Course Objectives

- 1. In this course, students will learn how to program complex parts using AutoDesk Fusion 360 to create the G-code needed to run the parts on the machines.
- 2. Students will learn the procedure of saving their G-code to a USB drive from the computer software.
- 3. Students will learn the process of loading their programs from the usb drive to the machine controller.
- 4. Students will learn the process of reading their programs on the CNC machine.
- 5. Students will learn the process of editing and making needed changes to their programs.
- 6. Students will learn the process of preparing the program for machine set up.
- 7. Accurately locate multiple zero positions and set tool offsets.
- 8. Demonstrate the ability to adjust speeds and feeds during a program run to optimal cutting conditions.
- 9. Describe the process of using the machine to prove out a program without first making the part.

## Lecture Content

Review of CNC machine fundamentals Overview of state-of-the-art machine features Machining center zero techniques Machine zero Part zero procedures Program zero option Tool length offset procedures on a machining center Standard method using Tool Offset Measure Methods of using fixture offsets Using advanced autocycles for: Bolt circles Pockets Lettering Tapping Drilling Profiling

## Lab Content

CNC machine fundamentals performed on the Machine's CPU Overview of state-of-the-art machine features in the lab using the UMC-750/UMC 500 HAAS 5 Axis Mill Machining center zero techniques performed and practiced using the UMC-750 HAAS 5 Axis Mill Machine zero Part zero procedures Program zero option Tool length offset procedures on a performed and practiced using the UMC-750 HAAS 5 Axis Mil Standard method using Tool Offset Measure D

## Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- DE Online Lecture (02X)
- Lab (04)
- DE Live Online Lab (04S)
- DE Online Lab (04X)

## Instructional Techniques

Lecture, demonstration, and laboratory activity on the 5 axis CNC mill

## Reading Assignments

Students will be given handouts as study guides. Approximately 2.5 hours per week..

## Writing Assignments

Writing assignments include: 1. Writing and editing CNC programs for the 5 Axis Machine2. Providing written answers to assigned questions 3. Performing arithmetic calculations as assigned, including geometric layouts of machined parts 4. Maintaining a notebook of class assignments and activities Approximately 2.5 hours per week.

## Out-of-class Assignments

Students will write manual CNC programs in preparation for running the programs on the machine. Approximately 2.5 hours per week.

## Demonstration of Critical Thinking

Mid term, lab assignments, final project

## Required Writing, Problem Solving, Skills Demonstration

Students will write short answer to quizzes and define certain types of machine language codes

## Eligible Disciplines

Machine tool technology (tool and die making): Any bachelor's degree and two years of professional experience, or any associate degree and six years of professional experience.

## Manuals Resources

1. Haas Automation. 1. Haas Automation Inc.. Mill Operator's Manual, Haas Automation Inc., 12-02-2017, Haas Automation , 12-02-2017 2. Haas

Automation. 2. Haas Automation Inc. UMC-750 supplement manual, Haas Automation Inc, 12-01-2018, Haas Automation , 12-01-2018