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
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 Machines 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 bachelors 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 Operators 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