ADVM 0005B - CNC MILLING MACHINE SETUP

Catalog Description

Prerequisite: Completion of ADVM 0005A with grade of "C" or better
Hours: 72 (18 lecture, 54 laboratory)
Description: Introduces the setup of Computer Numerical Controlled (CNC) milling machine operation. This course provides the basic knowledge necessary for a CNC milling machine set-up operator to validate CNC programs and machine set-up. It introduces students to basic CNC machine set-up principles, including setting tool length and work coordinate systems to machine parts safely and accurately. Students learn the basics of cutting tools and work holding technology. This course covers the first article inspection process, cutting tool nomenclature, and safely setting up and running milling machines to set up sheets for pre-validated programs. This course prepares students for entry-level employment as a CNC Milling Machine Set-up Operator. (not transferable)

Course Student Learning Outcomes

- CSLO #1: Identify and apply cutting tool nomenclature and selection for different materials.
- CSLO #2: Validate the machine setup by inspecting first-article parts on assigned CNC projects.
- CSLO #3: Create a basic program using manual programming methods.

Effective Term

Fall 2026

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

36

Total Student Learning Hours

108

Course Objectives

Lecture Objectives

1. Understand the role of a setup operator in part quality and program validation.
2. Recall machine safety, power-up, and homing procedures
3. Interpret prints for datums, reference dimensions, and GD&T features
4. Select workholding methods for different applications
5. Identify cutting tool nomenclature and classification: end mills, drills, facemills
6. Compare machine and work coordinate systems
7. Identify errors in program logic, toolpaths, and clearance moves
8. Explain tool length and diameter offsets
9. Develop a setup plan for the provided part drawing
10. Select a proper vise and workholding arrangement
11. Identify primary datums and fixture references
12. Describe the purpose and process of first article inspection (FAI)
13. Final written assessment aligned with industry standard competencies

Lab Objectives

1. Demonstrate loading and running the pre-validated demo program
2. Identify and inspect setup components: vises, parallels, soft jaws
3. Prepare setup documentation and verification checklist
4. Use mechanical edge finders to locate the part origin
5. Demonstrate sweeping vises and fixtures with indicators for alignment
6. Demonstrate the establishment and recording of WCS offsets
7. Demonstrate the use of a spindle or table-mounted probing system for zero location.
8. Demonstrate loading a number of tools in the machine's Automatic Tool Changer.
9. Set tool length offsets manually with a height setter or gauge pin
10. Use a probing system for automatic tool measurement
11. Verify offset values and update the setup sheet
12. Execute dry run of pre-validated programs
13. Verify tool clearance, spindle direction, and feed correctness
14. Validate setup sheet data: tool order, work offsets, feed/speed values
15. Adjust tool or work offsets as needed to achieve dimensional accuracy
16. Write and test a manual program for facing, pocketing, and drilling operations
17. Verify program operation using graphics and dry-run modes
18. Evaluate and edit code for accuracy and efficiency
19. Machine a simple part following safety and verification protocols
20. Create and evaluate first article part from validated setup
21. Assess part by comparing measured dimensions to blueprint tolerances
22. Record mesurements on a first article inspection report
23. Calculate corrective offset or tool wear adjustments based on findings
24. Perform full setup and to CNC machine assigned projects
25. Validate program and offsets
26. Final practical assessment aligned with industry standard competencies

General Education Information

- Approved College Associate Degree GE Applicability
- CSU GE Applicability (Recommended-requires CSU approval)
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)

Articulation Information

- Not Transferable

Methods of Evaluation

- Objective Examinations
  - Example: Students will take a multiple-choice and fill-in examination on G-code. Standard Grading. Example; List the G-Codes for the four common hole operations.
- Projects
  - Example: The instructor-assigned student projects are evaluated to industry standards through the use of performance rubrics. Example: Comparison of blueprint to finished project part.
- Skill Demonstrations
  - Example: The instructor will use student skill demonstrations to evaluate student performance to industry standards as an entry level CNC operator. Example: Student will demonstrate work off-set on vertical mill.

Repeatable

No

Methods of Instruction

- Laboratory
- Lecture/Discussion
- Distance Learning

Lab:

1. Following an instructor demonstration for loading multiple tools into the machine's Automatic Tool Changer. Students are expected to load several tools in the machine's Automatic Tool Changer.

Lecture:

1. Instructor presents lecture on cutting tool nomenclature and classification: end mills, drills, facemills. Students are expected to Identify cutting tool nomenclature and classification: end mills, drills, facemills.

Distance Learning

1. Following a brief introduction video and reading assignment on Select workholding methods for different applications. Students will complete an online quiz utilizing multiple-choice and essay questions. Students will be expected to select workholding methods for appropriate for a given application.

Typical Out of Class Assignments
Reading Assignments

1. Students read the safety section from the machine manual and be prepared to discuss in class. 2. Students are required to read chapter on measurements and complete the review questions at the end of the chapter.

Writing, Problem Solving or Performance

1. Diagram tooth style vs dovetail holding and compare the sequence of manufacturing process of dovetail versus bite holding systems. Give examples of where each application has its best use. 2. Compare the advantages and disadvantages of vertical vs. horizontal milling centers

Other (Term projects, research papers, portfolios, etc.)
Required Materials

- Machining and CNC Technology
  - Author: Michael Fitzpatrick
  - Publisher: McGraw-Hill
  - Publication Date: 2024
  - Text Edition:
  - Classic Textbook?: No
  - OER Link:
  - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.