MACH 80A Course Outline as of Fall 2022

CATALOG INFORMATION

Dept and Nbr: MACH 80A   Title: CNC MACHINE I
Full Title: Computer Numeric Control Machining I
Last Reviewed: 2/28/2022

Units			Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	5.00		Lecture Scheduled	4.00	17.5	Lecture Scheduled	70.00
Minimum	5.00		Lab Scheduled	4.00	8	Lab Scheduled	70.00
			Contact DHR	0		Contact DHR	0
			Contact Total	8.00		Contact Total	140.00
			Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 140.00   Total Student Learning Hours: 280.00

Title 5 Category: AA Degree Applicable
Grading: Grade Only
Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:
Formerly:

Catalog Description:
This course introduces students to theoretical and operational characteristics of the Computer Numerical Control (CNC) machine tools. Students will be introduced to the integration of Computer-aided Drafting (CAD), design, and programming for Computer-aided Machining (CAM) of machine parts on the CNC machine tools. Applicable to entry-level computer numeric control machine tools operators.

Prerequisites/Corequisites:
Course Completion or Current Enrollment in MACH 51.1A (or MACH 51A)

Recommended Preparation:
Course Completion of CS 5

Limits on Enrollment:

Schedule of Classes Information:
Description: This course introduces students to theoretical and operational characteristics of the Computer Numerical Control (CNC) machine tools. Students will be introduced to the integration of Computer-aided Drafting (CAD), design, and programming for Computer-aided Machining (CAM) of machine parts on the CNC machine tools. Applicable to entry-level

computer numeric control machine tools operators. (Grade Only)
Prerequisites/Corequisites: Course Completion or Current Enrollment in MACH 51.1A (or MACH 51A)
Recommended: Course Completion of CS 5
Limits on Enrollment:
Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

		Effective:	Inactive:
AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:
CSU Transfer:	Transferable Effective: Spring 1995	Inactive:	
UC Transfer:	Effective:	Inactive:	

CID:

Certificate/Major Applicable:
Both Certificate and Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Write a program using General Function (G) & Miscellaneous Function (M) code
2. Identify basic CNC machining tools

Objectives:
At the conclusion of this course, the student should be able to:
1. Practice the safe use of tools and machines
2. Compare and contrast manual and CNC machine operations
3. Explain the relationship between the theory of CNC machine operation and machining processes
4. Generate two-dimensional geometric images for CNC machining projects using CAD software
5. Using a drafted image, write and interpret G&M code for machining a part on a CNC machine
6. Troubleshoot code for incorrectly machined parts
7. Calculate cutting speeds and feed speeds for various CNC machining operations
8. Select appropriate cutting tools for machining to CAD specifications
9. Diagnose basic problems faced in the operation of the CNC machines

Topics and Scope:

I. Introduction
    A. Shop safety
    B. Print reading and working drawings
    C. Shop orientation and machine identification-facility layout

II. Basic CNC Operations
    A. Manual versus CNC operations
        1. Use
        2. Capabilities
        3. Theoretical and operational characteristics
    B. CNC Accessories
    C. Cutting tools
        1. Characteristics
        2. Design
        3. Machining parameters
    D. Production methods
III. Materials
    A. Types
    B. Properties
IV. CAD for CNC machines
    A. Design for manufacturing
    B. Generating a two-dimensional image
V. CNC Machining
    A. CNC theory
    B. Writing G&M code (programming) for the CNC machines
        1. Translating a 2-dimensional image into G&M code
        2. Troubleshooting code
    C. CNC operation
    D. Production methods
VI. Other CNC Programs

All topics covered in lecture and lab

Assignment:

Lecture-Related Assignments:
1. Weekly reading (10-15 pages)
2. Weekly quizzes
3. Midterm
4. Final exam

Lab-Related Assignments:
1. G&M code programs for machining a part from CAD drawings (5-10)
2. Performance evaluations of set-up and operating procedures for the CNC machines (5-10)
3. CAD exercises and production of 2-dimensional drawings for CNC machining (5-10)
4. Manufactured projects on the CNC machine from engineering drawings (5-10)
5. Organize workspace and clean-up lab area (professionalism)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills
and/or require students to select, organize and explain ideas
in writing.

G&M code programs	Writing 5 - 5%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

G&M code programs

Problem solving 5 - 5%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Performance exams, lab projects

Skill Demonstrations 30 - 30%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes, midterm, final exam

Exams 50 - 50%

Other: Includes any assessment tools that do not logically fit into the above categories.

Professionalism

Other Category 10 - 10%

Representative Textbooks and Materials:

CNC Machining. Gizelbach, Richard. Goodheart-Willcox. 2009 (classic)
CNC Programming Handbook. 3rd ed. Smid, Peter. Industrial Press, Inc. 2007 (classic)
Instructor prepared materials