

I. COURSE DESCRIPTION:

- A. Department Information:
Division: Technical
Department: Machine Trades
Course ID: MACH 074A
Course Title: Set-up and Operation of Various Machine Controls
Units: 3
Lecture: 2 hours
Laboratory: 3 hours
Prerequisite: MACH 070A
- B. Catalog and Schedule Description:
The study of 2-D tool path, machine control programming, part fixture, tool applications, and management of data required to operate various CNC machines and inspection equipment.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon successful completion of the course, the student will be able to:

- A. Identify data input and output from three different computer controls.
B. Define common offsets.
C. Download files from computer disk to machine control.
D. Set machine Part Reference Zero (PRZ) Machine Reference Zero (MRZ).
E. Set-up tools, speeds, feeds from a set-up sheet.
F. Set-up three various parts utilizing CNC lathes and mills.

IV. COURSE CONTENT:

- A. Safety Overview
1. General safety
2. Identify shop hazards
3. OSHA (Occupational Safety Health Act)
- B. Machine control system
- C. Data management from and into machine control
- D. CNC machining centers and programming
- E. Pallets, part loading, and programming options
- F. Tooling for NC and CNC machines
1. Tooling consideration
2. Tool holder
3. Fixturing
- G. Advanced CNC applications and integration and the role it plays in manufacturing machine parts
- H. Tooling for hole and milling operations
1. Locating points
2. Tool offsets
3. Part production process
- I. CNC turning operations
1. Miscellaneous functions
2. Tool edge programming from controller
3. Turning cycles

V. METHODS OF INSTRUCTION:

- A. Lecture, individual consultation, and demonstration on programming processes

- B. Hands-on activities

VI. TYPICAL ASSIGNMENTS:

- A. Input a two-dimensional part into a computer control system utilizing an input device, i.e., floppy disk or direct input on machine control system.
- B. Write a process plan for milling a three-dimensional part utilizing three different tools for programming.
- C. Input information into machine control to implement various control functions to operate a machining center.
- D. Manufacture a two-dimensional part from wax utilizing program codes and tool path geometry.

VII. EVALUATION(S):

- A. Methods of Evaluation:
 - 1. Graded Projects:
 - Typical Projects:
 - a) Turning projects will include taper, radius, and thread manufacturing components, utilizing various machine control codes.
 - b) Milling projects will include two- and three-dimensional milling concepts.
 - 2. Exams:
 - a) Six-week exam
 - b) Mid-term exam
 - c) Final exam
 - Typical Questions:
 - i. Explain the meaning of the setting cutter compensation in control. Draw a diagram of tool path around a 1" square, along with G1 X&Y coordinates to illustrate.
 - ii. Which cutting method produces less heat at the part, requires less horsepower, and generally leaves a better surface finish?
 - d) Practical exam
- B. Frequency of Evaluation:
 - 1. Four project exercises (demonstration)
 - 2. Three programming exams (demonstration) 6-week, 12-week, 18-week
 - 3. Three written exams

VIII. TYPICAL TEXT(S):

Mastercam Handbook, Volume 1, CNC Software, Inc., Gig Harbor, WA, 2002
Mastercam Handbook, Volume 2, CNC Software, Inc., Gig Harbor, WA, 2002

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

3.5-inch-computer diskette

**Content Review Form
 PREREQUISITE COURSE**

Target Course: MACH 074A: Set-up and Operation of Various Machine Controls

Prerequisite Course: MACH 070A: Computer Numerical Control Machining I

Instructions:

- 1) List exit competencies (skills) from Prerequisite Course. These skills are listed in the “Student Outcomes” section of the Course Outline (“upon completion of the course, the student should be able to...”)
- 2) Indicate which of the listed exit competencies (skills) are necessary entry skills needed for success in the target course. Mark with an “X” each needed skill.
- 3) Indicate the degree of importance of each needed entry skill for course success, using the following rating scale:

1=Critical

2=Very Helpful

3=Desirable

Skills Analysis

Entry Skills in Target Course	Exit Skills Provided by Prerequisite Course (Mark with an X if needed and indicate Prerequisite Course if more than one).	Degree of Importance (Rate 1 – 3)
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1. Identify the basic concepts required in CNC programming.	X	1
2. Identify CNC programming vocabulary and commands.	X	1
3. Identify the Cartesian Coordinates System.	X	1
4. Solve trigonometry problems relevant to CNC programming.	X	1