Course Acronym:	MTT
Course Number:	10A
Descriptive Title:	Introduction to CAD/CAM
Division:	Industry and Technology
Department:	Machine Tool Technology
Course Disciplines:	Machine Tool Technology
Catalog Description:	This course covers the study of the fundamental concepts of Computer Aided Manufacturing (CAM). Concepts explored will include the application of computers in manufacturing, Computer Aided Design (CAD), Computer Numerical Control (CNC) programming.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	Machine Tool Technology 101 or equivalent experience
Enrollment Limitation:	
Hours Lecture (per week):	2.5
Hours Laboratory (per week):	1.5
Outside Study Hours:	5
Total Course Hours:	72
Course Units:	3
Grading Method:	Letter Grade only
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	Prior to July 1992
Transfer UC:	No
Effective Date:	
General Education: ECC Term:	
Other:	
CSU GE:	
Term:	
Other:	
IGETC:	

Term:	
Other:	

Student Learning Outcomes:	**SLO #1 HIGH SPEED STEEL END MILL** Student will calculate the correct rotations per minute (RPM) for a high speed steel end mill using the correct cutting speed and end mill diameter. **SLO #2 2-D COMPUTER DRAFTING** Students will be able to identify, differentiate between and use computer drafting system hardware, components, software systems and operating systems to create points, lines circles, dimensions and notes in two dimensions. **SLO #3 CNC MACHINED OBJECTS** Students will be able to input, edit, print and plot a CNC program and create toolpaths for two-axis CNC machines to create objects within specified tolerances.
Course Objectives:	1. Identify and define the use of computer system hardware components. 2. Identify and define the use of computer software, including high level languages, operating systems and applications programs. 3. Create points lines, circles, dimensions and notes on a computer aided drafting system. 4. Write a word address CNC machine program to perform point-to-point drilling and continuous path milling operation that would produce projects or exercises within the tolerance specified on engineering drawings. 5. Input, edit, print and back-plot a CNC program on a computer system. 6. Define the following terms: computer aided manufacturing, computer aided drafting, automated manufacturing, robotics, flexible manufacturing, manufacturing resource planning and computer integrated manufacturing. 7. Create toolpaths for two and three axis CNC machines using computer numerical control graphics systems.

Major Topics:	**I. PRINCIPLES OF CAD/CAM (3 hours, Lecture)**
	
	    A. Computer terminology
	    B. Acronyms
	    C. Career opportunities
	    D. CAD/CAM integration
	
	II. PRINCIPLES OF CAD/CAM (1 hour, Lab)
	
	    A. Computer terminology

B. Acronyms

III. COMPUTER TECHNOLOGIES (4 hours, Lecture)

A. History and development
B. Hardware
1. Central Processing Unit (CPU)
2. Storage devices
3. Peripheral devices
C. Software
1. High level languages
2. Business applications
3. Manufacturing applications
D. Microcomputers
E. Operating system
F. Libraries

IV. COMPUTER TECHNOLOGIES (3 hours, Lab)

A. History and development
B. Hardware
1. Central Processing Unit (CPU)
2. Storage devices
3. Peripheral devices
C. Software
1. High level languages
2. Business applications
3. Manufacturing applications
D. Microcomputers
E. Operating system
F. Libraries

V. COMPUTER AIDED DESIGN AND DRAFTING (6 hours, Lecture)

A. Introduction
B. Interactive computer graphics
C. Applications
D. Economics
E. Two dimensional drafting
1. Hardware requirements
2. System capabilities
3. Comparison of systems
F. Three dimensional computer aided design

VI. COMPUTER AIDED DESIGN AND DRAFTING (4 hours, Lab)

A. Introduction
B. Interactive computer graphics
C. Applications
D. Economics
E. Two dimensional drafting
1. Hardware requirements

2. System capabilities
3. Comparison of systems
F. Three dimensional computer aided design

VII. ENGINEERING DRAWINGS (4 hours, Lecture)

A. Dimensioning
B. Orthographic views
C. Tolerancing
D. Geometrical Dimensioning and Tolerancing (GDT)

VIII. ENGINEERING DRAWINGS (2 hours, Lab)

A. Dimensioning
B. Orthographic views
C. Tolerancing
D. GDT

IX. CNC (6 hours, Lecture)

A. Introduction
B. History and development
C. Applications
D. Control systems
E. Dimensioning and positioning systems
F. Input media
G. Machine tool language
H. Job planning

X. CNC (4 hours, Lab)

A. Introduction
B. History and development
C. Applications
D. Control systems
E. Dimensioning and positioning systems
F. Input media
G. Machine tool language
H. Job planning

XI. MANUAL PROGRAMMING (8 hours, Lecture)

A. Micro computer assisted manual programming
B. Computer aided parts programming
    1. Language
    2. Program construction
    3. Part programming versus machine tool programming
C. Interactive graphics programming

XII. MANUAL PROGRAMMING (6 hours, Lab)

A. Micro computer assisted manual programming

B. Computer aided parts programming
C. Languages
D. Program construction
E. Part programming versus machine tool programming
F. Interactive graphics programming

XIII. CNC MACHINE TOOL OPERATION (5 hours, Lecture)

A. Point-to-point operation
B. Linear interpolation
C. Circular interpolation
D. Canned cycles
E. Tooling

XIV. CNC MACHINE TOOL OPERATION (3 hours, Lab)

A. Point-to-point operation
B. Linear interpolation
C. Circular interpolation
D. Canned cycles
E. Tooling

XV. CAM (4 hours, Lecture)

A. Introduction
B. Automated manufacturing
C. Robotics
D. Flexible manufacturing systems
E. Implementing CAM
F. Solid modeling

XVI. CAM (2 hours, Lab)

A. Introduction
B. Automated manufacturing
C. Robotics
D. Flexible manufacturing systems
E. Implementing CAM
F. Solid modeling

XVII. INTEGRATED CAD/CAM (5 hours, Lecture)

A. Database conversion
B. Computer Integrated Manufacturing (CIM)
C. Manufacturing Resource Planning (MRP)

XVIII. INTEGRATED CAD/CAM (2 hours, Lab)

A. Database conversion
B. Computer Integrated Manufacturing (CIM)
C. Manufacturing Resource Planning (MRP)

Total Lecture Hours:	45
Total Laboratory Hours:	27
Total Hours:	72
Primary Method of Evaluation:	3) Skills demonstration
Typical Assignment Using Primary Method of Evaluation:	Prepare a three-page G code written program for the part shown in the engineering drawing provided. Submit written program to the instructor.
Critical Thinking Assignment 1:	Calculate the X and Y coordinate locations for the holes to be drilled in the part represented on the drawing supplied. Write calculations on a one-page lab report and submit to the instructor.
Critical Thinking Assignment 2:	Determine the sequence of operations to machine the part supplied and enter the sequence and tooling required on a job planning sheet. Submit planning sheet to the instructor.
Other Evaluation Methods:	Class Performance Homework Problems Other Exams Performance Exams Quizzes
Instructional Methods:	Demonstration Discussion Lab Lecture Multimedia presentations
If other:	
Work Outside of Class:	Answer questions Problem solving activity Skill practice Study
If Other:	Programming assignments
Up-To-Date Representative Textbooks:	James Valentino. <u>INTRODUCTION TO COMPUTER NUMERICAL CONTROL</u>. Prentice Hall, 2013. Discipline Standard
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	Removable memory media
Requisite:	
Category:	

Requisite course(s): List both prerequisites and corequisites in this box.	
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	
Requisite Skill:	
Requisite Skill and Matching Skill(s): Bold the requisite skill(s). If applicable	
Requisite course:	Machine Tool Technology 101
Requisite and Matching skill(s):Bold the requisite skill. List the corresponding course objective under each skill(s).	**Knowledge of hand tools and cutting tools used in the machining industry and the machining process.** MTT 101 - Select and use metal working hand tools to produce assigned work within the tolerances specified on engineering drawings. MTT 101 - Set up and operate power saws to rough finish assigned work within a minimum of 1/32 of an inch over the dimensions required on engineering drawings. MTT 101 - Set up and operate engine lathes to turn, face, center drill, thread, and cut off to produce assigned work within the tolerances specified on engineering drawings. MTT 101 -Set up and operate vertical and horizontal milling machines to square stock, mill flat surfaces, side mill, end mill, fly cut and slot to produce assigned work within the tolerances specified on engineering drawings.
Requisite Skill:	or equivalent experience
Requisite Skill and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s). If applicable	If students have taken Machine Tool Technology 101 at another college or have experience in machining, machine tools and cutting tools, they will have the experience needed to enroll in this course. It is recommended that students have knowledge of machining to enhance success in this course.
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Jerry Kinnan
Date:	10/23/2015
Original Board Approval Date:	09/01/1972

Last Reviewed and/or Revised by:	Victor De La Torre
Date:	03/03/2022
Last Board Approval Date:	11/21/2022