Course Acronym:	MTT
Course Number:	101
Descriptive Title:	Introduction to Conventional and CNC Machining
Division:	Industry and Technology
Department:	Machine Tool Technology
Course Disciplines:	Machine Tool Technology
Catalog Description:	In this course, students will be introduced to the principles and operation of conventional and Computer Numerically Controlled (CNC) machine tools with an emphasis on safety, measurement, hand tools, power saws, drilling machines, lathes, and milling and grinding machines focusing on practices and setups used in industry.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	
Enrollment Limitation:	
Hours Lecture (per week):	2
Hours Laboratory (per week):	6
Outside Study Hours:	4
Total Course Hours:	144
Course Units:	4
Grading Method:	Letter Grade and Pass/No Pass
Credit Status:	Credit, degree applicable
Transfer CSU:	Yes
Effective Date:	3/19/2007
Transfer UC:	No
Effective Date:	
General Education: ECC	
Term:	
Other:	
CSU GE:	
Term:	

Other:	
IGETC:	
Term:	
Other:	
Student Learning Outcomes:	**SLO #1 Measuring and Recording Dimensions** Given a ground steel block of known and verified dimensions, measure and record the three dimensions of the block using a micrometer to a precision of .001 inches. **SLO #2 Blue Prints** Given a Blue Print, student will use all manufacturing equipment available to manufacture the project on the Blue Print to noted specifications. **SLO #3 Orthographic Projections** The student will be able to solve shop math problems and interpret orthographic projection engineering drawings that incorporate geometric dimensioning and tolerancing to produce assigned work within the tolerances specified on engineering drawings.
Course Objectives:	1. Correctly apply machine shop safety practices with 100% accuracy. 2. Select and use metal working hand tools to produce assigned work within the tolerances specified on engineering drawings. 3. Measure and layout utilizing semi-precision and precision measuring tools to produce assigned work within the tolerances specified on engineering drawings. 4. 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. 5. Center drill, drill, ream, countersink, counterbore and tap threads to produce assigned work within the tolerances specified on engineering drawings. 6. 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. 7. 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. 8. Set up and operate grinding machines to sharpen lathe tool bits, and surface grind to produce assigned work within the tolerances specified on the engineering drawings. 9. Interpret orthographic projection engineering drawings that incorporate geometric dimensioning and tolerancing to produce assigned work within the tolerances specified on engineering drawings. 10. Solve shop math problems that involve speeds and feeds, threads, engineering drawing interpretation and calculations relating to machine tools.

Major Topics:	**I. Overview of Conventional and CNC Machining (2 hours, lecture)** 1. A. Machine tool technology analysis B. Safe shop practices in metalworking C. Hand tools and bench work D. Safety test **II. Overview of Conventional and CNC Machining (6 hours, lab)** 1. A. Machine tool technology analysis B. Safe shop practices in metalworking C. Hand tools and bench work D. Safety test **III. Machine Tool Calculations (2 hours, lecture)** 1. A. Speeds and feeds B. Lathe toolbit geometry **IV. Machine Tool Calculations (6 hours, lab)** 1. A. Speeds and feeds B. Lathe toolbit geometry **V. Measurement and Measuring Tools (4 hours, lecture)** 1. A. Rulers and scales B. Micrometers C. Vernier's calipers D. Other hand measurement tools **VI. Measurement and Measuring Tools (12 hours, lab)** 1. A. Rulers and scales B. Micrometers C. Vernier's calipers D. Other hand measurement tools **VII. Layout Tools (2 hours, lecture)** 1. A. Layout tables B. Height gage C. Marking fluids

D. Layout hand tools

VIII. Layout Tools (6 hours, lab)

1.
   A. Layout tables
   B. Height gage
   C. Marking fluids
   D. Layout hand tools

IX. Materials of Manufacture (2 hours, lecture)

A. Ferrous
B. Non-ferrous
C. Carbon steels
D. Cast irons
E. Alloys

X. Materials of Manufacture (6 hours, lab)

A. Ferrous
B. Non-ferrous
C. Carbon steels
D. Cast irons
E. Alloys

XI. Power Saws (2 hours, lecture)

1.
   A. Power hack saws
   B. Vertical band saws
   C. Horizontal band saws
   D. Band saw blade selection
   E. Band saw operations

XII. Power Saws (6 hours, lab)

1.
   A. Power Saws
   B. Power hack saws
   C. Vertical band saws
   D. Horizontal band saws
   E. Band saw blade selection
   F. Band saw operations

XIII. Reading Engineering Drawings (2 hours, lecture)

1.
   A. Views
   B. Orthographic projection
   C. Isometric projection
   D. Alphabet of lines

E. Detail drawing versus assembly drawing
F. Drawing page layout

XIV. Reading Engineering Drawings (6 hours, lab)

1.
A. Views
B. Orthographic projection
C. Isometric projection
D. Alphabet of lines
E. Detail drawing versus assembly drawing
F. Drawing page layout

XV. Engine Lathes (4 hours, lecture)

1.
A. Engine lathe parts
B. Lathe accessories
C. Cutting speeds, feeds, and depth of cut
D. Lathe operations

XVI. Engine Lathes (12 hours, lab)

1.
A. Engine lathe parts
B. Lathe accessories
C. Cutting speeds, feeds, and depth of cut
D. Lathe operations

XVII. Threads (4 hours, lecture)

1.
A. Thread terminology
B. Thread forms
C. Thread fits and classifications
D. Thread calculations
E. Thread cutting
F. Thread measurement

XVIII. Threads (12 hours, lab)

1.
A. Thread terminology
B. Thread forms
C. Thread fits and classifications
D. Thread calculations
E. Thread cutting
F. Thread measurement

XIX. Drilling Operations (2 hours, lecture)

1.

A. Drill presses
B. Drilling machine accessories
C. Twist drills
D. Cutting speeds and feeds
E. Drilling holes
F. Drill press operations

XX. Drilling Operations (6 hours, lab)

1.
A. Drill presses
B. Drilling machine accessories
C. Twist drills
D. Cutting speeds and feeds
E. Drilling holes
F. Drill press operations

XXI. Conventional Milling Machines (2 hours, lecture)

1.
A. Milling machines and accessories
B. Milling cutters
C. Cutting speeds, feeds and depth of cut
D. Milling machine setups
E. Milling operations

XXII. Conventional Milling Machines (6 hours, lab)

1.
A. Milling machines and accessories
B. Milling cutters
C. Cutting speeds, feeds and depth of cut
D. Milling machine setups
E. Milling operations

XXIII. CNC Milling Machines, Introduction and Demonstration (6 hours, lecture)

1.
A. Type of CNC milling machines
B. Cartesian coordinate system
C. Point-to-point positioning
D. Continuous-path control
E. Absolute programming
F. CNC setup and operation

XXIV. CNC Milling Machines, Introduction and Demonstration (18 hours, lab)

1.
A. Type of CNC milling machines
B. Cartesian coordinate system
C. Point-to-point positioning
D. Continuous-path control

	E. Absolute programming F. CNC setup and operation **XXV. Grinding Machines (2 hours, lecture)** 1. A. Types of grinding machines B. Surface grinding C. Accessories D. Surface-grinding operations **XXVI. Grinding Machines (6 hours, lab)** 1. A. Types of grinding machines B. Surface grinding C. Accessories D. Surface-grinding operations
Total Lecture Hours:	36
Total Laboratory Hours:	108
Total Hours:	144
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	A drilling machine is to be set-up for drilling a .75 diameter hole in a piece of 2024-T4 aluminum: 1. What is the Cutting Speed (CS) and Feed Per Tooth (FPT) for 2024-T4 aluminum? 2. What are the formulas for calculating Revolutions per Minute (RPM) and feed? 3. Calculate the RPM and feed for the above problem, record on a one page report and submit to the instructor for evaluation.
Critical Thinking Assignment 1:	Analyze the engineering specifications for part number MS-13, "C-Clamp," and determine the needed cutting tools and accessories to machine the frame. Set up a conventional vertical milling machine and perform the machining operations required to complete the part. Measure the completed part and record any part features not within the tolerance specified on a one-page inspection report and submit to the instructor for evaluation.
Critical Thinking Assignment 2:	According to the engineering specifications for the "C-Clamp Swivel Pad," a bevel must be machined on the lathe. Given the diameters and length of the part, calculate the angle for setting the compound rest. Make the necessary adjustment on the machine and take a trial cut to confirm your calculations. Finish by machining the bevel within the tolerance specified. Submit part to the instructor for evaluation.
Other Evaluation Methods:	Performance Exams Other Exams Quizzes

	Written Homework Laboratory Reports Class Performance Homework Problems Term or Other Papers Multiple Choice Completion Matching Items True/False
Instructional Methods:	Demonstration Discussion Group Activities Internet Presentation/Resources Laboratory Lecture Multimedia presentations
If other:	Internet Presentation/Resources
Work Outside of Class:	Study Answer questions Required reading Problem solving activities Written work
If Other:	
Up-To-Date Representative Textbooks:	Stephen Krar. TECHNOLOGY OF MACHINE TOOLS. 8th edition. McGraw Hill. 2020.
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	Safety glasses or goggles Steel rule - flexible - 6" Clean shop coat/apron Lathe tool bits- 3/8" square - High Speed Steel (HSS) Materials for projects Scientific calculator Pocket trigonometric tables
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:	
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. List the corresponding course objective under each skill(s). If applicable	
Enrollment Limitations and Category:	
Enrollment Limitations Impact:	
Course Created by:	Harold Hofmann/Eric Carlson
Date:	02/01/2007
Original Board Approval Date:	03/19/2007
Last Reviewed and/or Revised by:	ERIC CARLSON
Date:	03/02/2022
Last Board Approval Date:	04/18/2022