

Course Acronym:	MTT		
Course Number:			
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		
<b>Total Course Hours:</b>	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:	Νο		
Effective Date:			
General Education: ECC			
Term:			
Other:			
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Other:			
Student Learning Outcomes:	<ul> <li>SLO #1 Measuring and Recording Dimensions</li> <li>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.</li> <li>SLO #2 Blue Prints</li> <li>Given a Blue Print, student will use all manufacturing equipment available to manufacture</li> </ul>		
Course Objectives:	<ol> <li>Correctly apply machine shop safety practices with 100% accuracy.</li> <li>Select and use metal working hand tools to produce assigned work within the tolerances specified on engineering drawings.</li> <li>Measure and layout utilizing semi-precision and precision measuring tools to produce assigned work within the tolerances specified on engineering drawings.</li> <li>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.</li> <li>Center drill, drill, ream, countersink, counterbore and tap threads to produce assigned work within the tolerances specified on engineering drawings.</li> <li>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.</li> <li>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 the engineering drawings.</li> <li>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.</li> <li>Interpret orthographic projection engineering drawings that incorporate geometric dimensioning and tolerancing to produce assigned work within the tolerances specified on engineering drawings.</li> <li>Solve shop math problems that involve speeds and feeds, threads, engineering drawing interpretation and calculations relating to machine tools.</li> </ol>		

	I. Overview of	Conventional and CNC Machining (2 hours, lecture)	
	1		
	1.	Machine tool technology analysis	
		Safe shop practices in metalworking	
		Hand tools and bench work	
		Safety test	
	II. Overview of Conventional and CNC Machining (6 hours, lab)		
	1.		
	А.	Machine tool technology analysis	
	В.	Safe shop practices in metalworking	
	С.	Hand tools and bench work	
	D.	Safety test	
	III. Machine Tool Calculations (2 hours, lecture)		
	1.	Creade and feeds	
		Speeds and feeds	
	D.	Lathe toolbit geometry	
	IV. Machine To	ool Calculations (6 hours, lab)	
	1.		
Major Topics:		Speeds and feeds	
		Lathe toolbit geometry	
	V. Measureme	nt and Measuring Tools (4 hours, lecture)	
	1.		
		Rulers and scales	
		Micrometers	
		Vernier's calipers	
	D.	Other hand measurement tools	
	VI. Measurement and Measuring Tools (12 hours, lab)		
	1.		
		Rulers and scales	
		Micrometers	
		Vernier's calipers	
		Other hand measurement tools	
	VII. Layout Too	ols (2 hours, lecture)	
	1		
	1.	Layout tables	
		Height gage	
		Marking fluids	
	<b>.</b>		

#### 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)

- 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

	<ul><li>E. Absolute programming</li><li>F. CNC setup and operation</li></ul>	
	XXV. Grinding Machines (2 hours, lecture)	
	1.	
	<ul> <li>A. Types of grinding machines</li> <li>B. Surface grinding</li> <li>C. Accessories</li> <li>D. Surface-grinding operations</li> </ul>	
	XXVI. Grinding Machines (6 hours, lab)	
	<ol> <li>A. Types of grinding machines</li> <li>B. Surface grinding</li> <li>C. Accessories</li> <li>D. Surface-grinding operations</li> </ol>	
Total Lecture Hours:	36	
Total Laboratory Hours:	108	
Total Hours:	144	
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)	
	A drilling machine is to be set-up for drilling a .75 diameter hole in a piece of 2024-T4 aluminum:	
Using Primary Method of		
Evaluation.	<ol> <li>What are the formulas for calculating Revolutions per windte (RPM) and reed?</li> <li>Calculate the RPM and feed for the above problem, record on a one page report and submit to the instructor for evaluation.</li> </ol>	
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
	Demonstration
	Discussion
Instructional	Group Activities
Methods:	Internet Presentation/Resources
Methods.	Laboratory
	Lecture
	Multimedia presentations
If other:	Internet Presentation/Resources
	Study
	Answer questions
Work Outside of Class:	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:	
Readings:	
	Safety glasses or goggles
	Steel rule - flexible - 6"
	Clean shop coat/apron
Other Required Materials:	Lathe tool bits- 3/8" square - High Speed Steel (HSS)
	Materials for projects
	Scientific calculator
	Scientific calculator Pocket trigonometric tables

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