



El Camino College
COURSE OUTLINE OF RECORD – Official

Course Acronym:	MTT
Course Number:	40
Descriptive Title:	Machine Shop Calculations
Division:	Industry and Technology
Department:	Machine Tool Technology
Course Disciplines:	Machine Tool Technology, Manufacturing Technology
Catalog Description:	This course covers the study of machine shop problems involving the solution of formulas related to screw threads, feeds and speeds, spur gears, simple and angular indexing. Geometric figures, angles, triangles, circles, arcs, trigonometric functions, compound angles and oblique triangles will also be introduced.
Prerequisite:	
Co-requisite:	
Recommended Preparation:	Machine Tool Technology 2 and Mathematics 23
Enrollment Limitation:	
Hours Lecture (per week):	3
Hours Laboratory (per week):	0
Outside Study Hours:	6
Total Course Hours:	54
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:	<p>SLO #1 HSS Setting the Speed</p> <p>Student will calculate the correct feed per minute for a high speed steel (HSS) end mill using the correct feed per tooth (CL), rotations per minute (RPM), and number of teeth.</p> <p>SLO #2 Screw Threading</p> <p>The student will be able to compute and perform screw threading operations to include 60 degree thread formulas, acme thread formulas and calculations of the parts of a screw thread to industry standard tolerances.</p> <p>SLO #3 Geometric Figures</p> <p>The student will be able to sketch geometric figures to include perpendicular bisectors, parallel and tangent lines and use trigonometric principles to solve problems that include similar triangles, isosceles triangles, right triangles and polygons.</p>
Course Objectives:	<ol style="list-style-type: none"> 1. Calculate the proper cutting speeds and feeds for lathes, milling machines and drilling machines. 2. Compute answers for screw threading operations to include 60 degree thread formulas, acme thread formulas and calculations of the parts of a screw thread to industry standard tolerances. 3. Sketch geometric figures to include perpendicular bisectors, parallel and tangent lines. 4. Using trigonometric principles, solve problems that include similar triangles, isosceles triangles, right triangles and polygons. 5. Solve right triangle problems using trigonometric functions. 6. Compute angles of rotation and angles of tilt in compound angle plate positioning for machining compound-angular surfaces as given in regular solids.
Major Topics:	<p>I. OVERVIEW OF MACHINE SHOP CALCULATIONS (1 hour, lecture)</p> <ol style="list-style-type: none"> A. Basic arithmetic number systems B. Diagnostic evaluation <p>II. APPLICATION OF FORMULAS TO CUTTING SPEEDS (4 hours, lecture)</p> <ol style="list-style-type: none"> A. Cutting speeds for mills B. Cutting speeds for lathes <p>III. INDEXING (4 hours, lecture)</p> <ol style="list-style-type: none"> A. Dividing head mechanism and ratio B. Simple indexing

- C. Angular indexing
- D. Spur gear calculations

IV. INTRODUCTION TO GEOMETRIC FIGURES (4 hours, lecture)

- A. Plane geometry
 - 1. Points and lines
 - 2. Angles
- B. Protractors
 - 1. Simple protractor
 - 2. Bevel protractor with Vernier scale

V. ANGLES (4 hours, lecture)

- A. Naming angles
 - 1. Types of angles
 - 2. Angles formed by transversal
 - 3. Introduction to triangles
- B. Types of triangles
 - 1. Angles of a triangle
 - 2. Corresponding parts of triangles

VI. GEOMETRIC PRINCIPLES FOR TRIANGLES AND OTHER COMMON POLYGONS (4 hours, lecture)

- A. Congruent triangles
 - 1. Similar triangles
 - 2. Isosceles, equilateral and right triangles
- B. Introduction to circles
 - 1. Definitions
 - 2. Circumference formula

VII. INTRODUCTION TO TRIGONOMETRIC FUNCTIONS (4 hours, lecture)

- A. Ratio of right triangle sides
- B. Identifying right triangle sides
- C. Trigonometric function table

	<p>VIII. BASIC CALCULATIONS OF ANGLES AND SIDES OF RIGHT TRIANGLES (4 hours, lecture)</p> <ul style="list-style-type: none"> A. Basic examples B. Complex examples <p>IX. ENGLISH AND METRIC GAGE BLOCKS (4 hours, lecture)</p> <ul style="list-style-type: none"> A. Linear applications B. Angular applications <p>X. THE CARTESIAN COORDINATE SYSTEM (4 hours, lecture)</p> <ul style="list-style-type: none"> A. History B. Definitions C. Use <p>XI. TRIGONOMETRY - PRACTICAL MACHINE APPLICATIONS (10 hours, lecture)</p> <ul style="list-style-type: none"> A. Mill applications B. Lathe applications <p>XII. OBLIQUE TRIANGLES LAW OF SINES AND LAW COSINES (4 hours, lecture)</p> <ul style="list-style-type: none"> A. Planar application B. Spherical application <p>XIII. MACHINING COMPOUND ANGLULAR SURFACES AND COMPUTING ANGLES OF ROTATION AND TILT (3 hours, lecture)</p> <ul style="list-style-type: none"> A. Machining compound angles B. Procedures for positioning a part for machining C. Formulas for computing angles of rotation and tilt
Total Lecture Hours:	54
Total Laboratory Hours:	0
Total Hours:	54
Primary Method of Evaluation:	2) Problem solving demonstrations (computational or non-computational)
Typical Assignment Using Primary Method of Evaluation:	Three cuts are required to turn a steel shaft. The depths of the cuts, in millimeters, are 6.25, 3.18, and 0.137. How much stock has been removed per side? Write calculations on a one-page report and submit to the instructor for evaluation.
Critical Thinking Assignment 1:	A tool and die maker grinds a pin to an 18.25 millimeter diameter. The pin is to be pressed (an interference fit) in a hole. The minimum interference allowed is 0.03 millimeter. The maximum interference allowed is 0.07 millimeter. Determine the mean diameter of the hole. Write calculations on a one-page report and submit to the instructor for evaluation.

Critical Thinking Assignment 2:	A machine produces 2,550 parts in 8.5 hours. How many parts are produced by the machine in 10 hours? Write calculations on a one-page report and submit to the instructor for evaluation.
Other Evaluation Methods:	Homework Problems Matching Items Multiple Choice Other - specified Other Exams Quizzes True/False
Instructional Methods:	Demonstration Discussion Lecture
If other:	
Work Outside of Class:	Answer questions Journal Problem solving activity Skill practice Written work Study
If Other:	
Up-To-Date Representative Textbooks:	Thomas Achatz, <u>TECHNICAL SHOP MATHEMATICS</u> , 3rd Edition, Industrial Press, 2006. DISCIPLINE STANDARD Edward G. Hoffman, <u>SHOP REFERENCE FOR STUDENTS AND APPRENTICES</u> , 2nd Edition, Industrial Press, 2001. DISCIPLINE STANDARD Christopher Mc Cauley, <u>MACHINERY'S HANDBOOK POCKET COMPANION</u> , Industrial Press, 2 nd edition, 2020
Alternative Textbooks:	
Required Supplementary Readings:	
Other Required Materials:	Scientific calculator with trigonometric functions Notebook Protractor Triangle
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 2 and Mathematics 23
Requisite and Matching skill(s): Bold the requisite skill. List the corresponding course objective under each skill(s).	<p>Ability to read manufacturing prints.</p> <p>MTT 2 - Compare and contrast the lines, views, title blocks, dimensions, tolerances, pictorials, materials lists, notes, changes, machine processes and symbols used on engineering drawings.</p> <p>MTT 2 - Analyze engineering drawings with one or more views, thread specifications and dimensions, machine operation callouts, dimensions, tolerances and geometric dimensioning and tolerancing.</p> <p>Ability to perform basic bath computations.</p> <p>MATH 23 - Perform various operations (addition, subtraction, multiplication, division, and exponentiation) on different sets of numbers (whole, integer, and rational) and recognize equivalence when it occurs, particularly with fractions, decimals and percent.</p>
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:	Franz Seifert
Date:	11/09/2015
Original Board Approval Date:	09/01/1978
Last Reviewed and/or Revised by:	TIM MONZELLO

Date:	03/02/2022
Last Board Approval Date:	04/18/2022