



Western Technical College

## 31804338 Manufacturing Math 3

### Course Outcome Summary

#### Course Information

|                            |   |
|----------------------------|---|
| <b>Description</b>         | A continuation of Manufacturing Math 1&2 for the machine tool trades. Topics include measurement, both the U.S. customary and metric systems, area and volume of two- and three-dimensional geometric figures, the trigonometric functions, right and oblique triangle trigonometry, and compound angles. Practical machine applications are emphasized throughout. |
| <b>Career Cluster</b>      | Manufacturing   |
| <b>Instructional Level</b> | One-Year Technical Diploma  |
| <b>Total Credits</b>       | 1   |
| <b>Total Hours</b>         | 36  |

#### Textbooks

*Mathematics for Machine Technology*. 8th Edition. Copyright 2020. Smith, Robert D. Publisher: Cengage Learning. **ISBN-13:** 978-1-337-79831-0. Required.

#### Learner Supplies

Scientific calculator - \$10-20. **Vendor:** Campus Shop. Required.

Six-inch steel rule - \$3.00. **Vendor:** Campus Shop. Required.

#### Success Abilities

1. Cultivate Passion: Expand a Growth-Mindset
2. Live Responsibly: Develop Resilience
3. Live Responsibly: Foster Accountability
4. Refine Professionalism: Improve Critical Thinking

#### Course Competencies

1. Solve problems involving 2D and 3D geometric figures.

## Assessment Strategies

- 1.1. Written Objective Test

### Criteria

*You will know you are successful when*

- 1.1. you calculate perimeter, area, and volume of geometric figures.
- 1.2. you select and use the appropriate geometric formula/s to solve application problems.
- 1.3. you use gauge block tables to compute heights needed to set heights for machining purposes.

### Learning Objectives

- 1.a. Identify the formulas for area of triangles, parallelograms, and trapezoids.
- 1.b. Calculate the area of triangles, parallelograms, and trapezoids.
- 1.c. Identify the formulas for area of circles, sectors, and segments.
- 1.d. Calculate the area of circles, sectors, and segments.
- 1.e. Identify the formulas for volume of prisms, cylinders, pyramids, and cones.
- 1.f. Calculate the volume of prisms, cylinders, pyramids, and cones.
- 1.g. Identify the formulas for volume of spheres and cones.
- 1.h. Calculate the volume of spheres and cones.
- 1.i. Calculate the volume of composite figures.
- 1.j. Solve application problems involving geometric shapes.

## 2. Solve right triangle applications using trigonometry.

### Assessment Strategies

- 2.1. Written Objective Test

### Criteria

*You will know you are successful when*

- 2.1. you apply right triangle solving techniques to simple machine tool applications.
- 2.2. you solve application exercises involving right angles.
- 2.3. you determine the value of an angle in decimal degrees and degrees, minutes, seconds.
- 2.4. you find the sine, cosine, and tangent of angles.
- 2.5. you use the cosecant, secant, and cotangent ratios in angle calculations.
- 2.6. you convert angular measures between decimal degrees and angles measures in degrees, minutes, and seconds.
- 2.7. you solve basic right triangles with angles measured in decimal degrees and degree - minutes - seconds.

### Learning Objectives

- 2.a. Apply the sine, cosine, or tangent ratios to set up and solve equations.
- 2.b. Determine the sine, cosine, or tangent function for angles expressed in decimal degrees and in degrees and minutes.
- 2.c. Given the value of the sine, cosine, or tangent ratio calculate the measure of an angle.
- 2.d. Determine the value of an angle for any trig ratio to the nearest minute.
- 2.e. Use the cosecant, secant, or cotangent ratio to find the value of an angle.
- 2.f. Solve a right triangle when two sides are known.
- 2.g. Solve a right triangle when one side and one acute angle are known.
- 2.h. Use basic right triangle concepts to find the solutions to application problems (examples include sine bar and sine plates, tapers and bevels, distance between holes and V-slots, V-blocks, threaded wire lengths for checking dimensions, angle cuts).

## 3. Apply trigonometric laws to solve oblique triangles.

### Assessment Strategies

- 3.1. Written Objective Test

### Criteria

*You will know you are successful when*

- 3.1. you solve simple oblique triangles using the Sine Law.
- 3.2. you solve simple oblique triangles using the Cosine Law.

### Learning Objectives

- 3.a. Apply certain right triangle properties to oblique triangles.
- 3.b. Use the Pythagorean Property to develop the Sine Law.
- 3.c. Solve oblique triangle applications when two angles and one side is known.
- 3.d. Solve oblique triangle applications when two sides and an angle opposite one of the sides is known.
- 3.e. Learn conditions necessary to have two different solutions when given two sides and an angle opposite of the sides.
- 3.f. Apply the Cosine Law to solve applications involving oblique triangles.
- 3.g. Apply the Sine Law or Cosine Law to do machine shop applications.

## 4. Compute the solution for applications involving compound angles.

### Assessment Strategies

- 4.1. Written Objective Test

### Criteria

*You will know you are successful when*

- 4.1. you compute the true length and the true angle of a diagonal in a rectangular solid.
- 4.2. you compute the angles of rotation and tilt in a rectangular solid.
- 4.3. you calculate the angular value formed by the intersection of two angular surfaces.

### Learning Objectives

- 4.a. Use the fact that the true length of a line shown where the line is contained in a plane viewed from the perpendicular line of sight to find the true length of a diagonal in a rectangular solid.
- 4.b. Apply basic trigonometry to calculate the angular value for the true angle of a diagonal in a rectangular solid.
- 4.c. Calculate the angle of rotation and the angle of tilt when the length, width, and height of the rectangular solid are known.
- 4.d. Compute the angles of rotation and tilt by first sketching and labeling the compound angular components within a rectangular solid.
- 4.e. Compute angles of rotation and tilt of holes axis in a rectangular solid when no length dimensions are known.
- 4.f. Determine the angles of rotation and tilt by using formulas.

## 5. Solve complex machine tool applications.

### Assessment Strategies

- 5.1. Written Objective Test

### Criteria

*You will know you are successful when*

- 5.1. you relate given dimensions to the unknown value and determine what additional dimensions are required for the solution.
- 5.2. you determine the auxiliary lines needed to form right triangles essential for the solution.
- 5.3. you apply right triangle solving techniques to do applications involving two or more right triangles.
- 5.4. you solve application exercises involving right and oblique angles.

### Learning Objectives

- 5.a. Draw auxiliary lines where needed, to form right triangles to do machine tool applications.
- 5.b. Solve taper applications involving more than one right triangle.
- 5.c. Solve V-slot applications involving more than one right triangle.
- 5.d. Determine the required angular value for applications with a series of holes.
- 5.e. Compute the unknown length or unknown angle in machine tool applications involving two or more right triangles.