STRANDS AND STANDARDS
CAD MECHANICAL DESIGN 2

Course Description

The second in a sequence of courses that prepares individuals with an emphasis in developing technical knowledge and skills to develop 3D models in support of mechanical and industrial engineers, and related professionals. This includes instruction in the use of 3D Computer-Aided Design (CAD) software, model creation, and technical communication.

Core Code	38.01.00.00.052
Concurrent Enrollment Core Code	38.01.00.13.052
Units of Credit	0.5
Intended Grade Level	10-12
Prerequisite	None
Skill Certification Test Number	662
Test Weight	0.5
License Type	Secondary Education 6-12
Required Endorsement(s)	T&E Drafting (CAD)

STRAND 1

Students will understand and apply mathematics, measuring conventions, and scale.

Standard 1

Perform basic arithmetic functions using fractions and decimals.

- Add
- Subtract
- Multiply
- Divide

Standard 2

Accurately and efficiently convert between fractions and decimals.

- Decimal/fraction equivalent chart

Standard 3

Convert between metric and imperial measurements.

Standard 4

Demonstrate an ability to make and record basic measurements.

- Use scales, micrometers, and calipers (dial and digital) to take measurements.
- Understand and demonstrate the conversion of actual lengths to common technical drawing scales.
- Accurately scale drawings using CAD techniques when drawing and plotting.
- Record measurements using Cartesian and polar coordinates, as well as absolute and relative distances.

STRAND 2

Students will be able to create a 3D part model with the correct dimensional and geometric sizes and constraints.

Standard 1

Demonstrate exactness and precision when producing drawing geometry.

- Apply correct 3D geometric construction techniques.
- Model elements accurately and to scale.
- Create elements on the correct plane.

Standard 2

Be proficient in the use of terminology associated with 3D drafting and design.

- Axis
- Concentric
- Dimensional constraint
- Geometric constraint
- Coordinate
- Extrusion

- Isometric view
- Parallel
- Perpendicular
- Plane
- Tangent
- Vertical

Standard 3

Create proto-types of the model using a 3D printer.

STRAND 3

Students will be able to understand and demonstrate the use of correct line types.

Standard 1

Understand and use the recommended thickness of lines.

Standard 2

Understand and correctly employ conventionally used line types.

- Object lines
- Hidden lines
- Center lines
- Dimension lines
- Extension lines
- Leader lines
- Border lines
- Phantom lines
- Section lines
- Cutting Plane lines
- Construction line

STRAND 4

Students will be able to develop and correctly place sectional views.

Standard 1

Be familiar with and appropriately use section views.

- Full
- Half

Standard 2

Section lines are evenly spaced and drawn at a 45-degree angle unless a more appropriate angle is justified.

Standard 3

Cutting plane lines, section lines, and break lines are drawn according to the alphabet of lines.

Standard 4

Visible edges, hidden lines, and contours behind the cutting plane are correctly shown.

STRAND 5

Students will be able to understand and demonstrate essential tolerancing techniques.

Standard 1

Create limit dimensions.

Standard 2

Describe the nominal size, tolerance, limits, and allowances of two mating parts.

Standard 3

Identify a clearance fit, interference fit, and transition fits.

Standard 4

Describe and use the basic hole and the basic shaft systems.

Standard 5

Dimension two mating parts using limit dimension, unilateral tolerances, and bilateral tolerances.

Standard 6

Specify the classes of fits as required on exercises and drawings.

STRAND 6

Students will be able to understand and use 3D computer software to create technical drawings.

Standard 1

Know how to save, open, rename, and move data files using common computer operating system software.

Standard 2

Originate technical drawings using 3D CAD software features.
- Create a new drawing setup to support both English and metric drawing standards.
- Create drawing setups for different sizes of drawing sheets.
- The top, front, and side views are used unless otherwise required using orthographic projection.
- All views are properly aligned and use third-angle projection.
- Appropriate lines and surfaces are located on each view.

Standard 3

Add correct annotation to drawings.
- Use the correct text height

- Use Gothic letters and numerals
- Understand the placement and use of general notes
- Prepare and/or understand title blocks

Standard 4

Plot to scale and use correct plot specifications.
- Plot drawings with correct line widths.

Skill Certificate Test Points by Strand

Example table below. Refer to instructions for specifics.

Test Name	Test #	Number of Test Points by Strand						Total Points	Total Questions
		1	2	3	4	5	6		
CAD Mechanical Design 2	662	10	14	12	7	4	12	59	38

Performance Skills

1. Create and maintain a portfolio of exemplary work.

2. Demonstrate practice of the *Technology & Engineering Professional Workplace Skills*. https://schools.utah.gov/cte/engineering/resources

3. Participate in a significant activity that provides each student with an opportunity to render service to others, employ leadership skills, or demonstrate skills they have learned through this course, preferably through participation in a Career & Technical Student Organization (CTSO) such as the Technology Student Association (TSA).