



Design Technology

Technical Design 1

This is the first instructional course in a sequence of courses that prepares individuals to develop technical knowledge and skills required to plan and prepare scale pictorial interpretations of engineering and design concepts. This includes instruction in the use of 2D/3D CAD software, sketching, drawing layout, geometric construction, orthographic projection, and dimensioning.

**Utah State Office of Education
Career & Technical Education**

TECHNICAL DESIGN 1

Levels:	Grades 10-12
Units of Credit:	Minimum 0.5 credits
CIP Code:	15.1301
11 Digit Code:	
11 Digit DE Code:	
Test #:	540
License:	CTE/Secondary
Endorsement:	Design Technology/CAD
Prerequisite:	None

COURSE DESCRIPTION

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CORE STANDARDS, OBJECTIVES, AND INDICATORS

STANDARD 1

Students will be able to understand, demonstrate, and apply mathematics and measuring skills.

Objective 1 Demonstrate, and apply related mathematics.

- a. Perform basic arithmetic functions.
 - Add, subtract, multiply, and divide whole numbers.
 - Add, subtract, multiply, and divide fractions.
 - Add, subtract, multiply, and divide decimals.
- b. Convert fractions/decimals.
 - Convert fractions to decimal equivalents.
 - Convert decimal values to nearest fractional equivalent.
- c. Convert metric/inch measurements.
 - Convert inch dimensions to millimeters.
 - Convert millimeter dimensions to inches.
- d. Perform basic trigonometric functions.
 - Solve for unknown angles.
 - Solve for unknown sides.

Objective 2 Demonstrate an ability to make and record basic measurements.

- a. Use scales, micrometers, and calipers to take measurements.
- b. Make and use measurements using fraction, and metric, and engineer's scales.
- c. Record measurements using Cartesian and polar coordinates, as well as absolute and relative distances.

- d. Understand and demonstrate the conversion of actual lengths to typical technical drawing scale factors.

STANDARD 2

Students will be able to understand and demonstrate the use of the alphabet of Lines

- Objective 1** Understand and demonstrate the recommended thickness of lines.
- Objective 2** Understand and demonstrate the correct use of line types.
- Objective 3** Understand and correctly use object, hidden, and center lines.
- Objective 4** Understand and correctly use dimension lines, extension lines and, leader lines.
- Objective 5** Identify border lines, phantom lines, section lines, and cutting plane lines and know their uses.

STANDARD 3

Students will be able to understand and demonstrate sketching techniques.

- Objective 1** Create freehand sketches using paper, pencil, and an eraser (without the benefit of a straight edge, compass, or template) which is neat, clear, and smudge-free.
- Objective 2** Understand and demonstrate the use of the alphabet of lines.
- Objective 3** Produce a sketch of an object using proportional relationships.
- Objective 4** Use letters and numerals that conform to a technical style.
- Objective 5** Demonstrate how words and letters are to be evenly spaced.
- Objective 6** Understand and demonstrate the use of oblique (cabinet and cavalier), isometric, and perspective views.
- Objective 7** Understand and use accepted dimensioning practices for sketches.

Standard 4

Students will be able to understand and develop multi-view drawings.

- Objective 1** The top, front, and side views are used unless otherwise required using orthographic projection.
- Objective 2** All views are properly aligned.
- Objective 3** Appropriate lines and surfaces are located on each view.

Standard 5

Students will be able to understand and demonstrate the use of geometric construction.

- Objective 1** Demonstrate exactness when producing drawing geometry.
- Objective 2** Drawing elements are accurate and drawn to scale.
- Objective 3** Use and know correct geometric construction techniques; i.e., tangencies, circles, arc, lines, polygons, ellipses, lines to quadrants, and irregular curves.

Standard 6

Know and follow ANSI Y14.5 dimensioning standards to apply the appropriate dimensions to drawings.

Objective 1 Understand and choose the best location for dimensions.

- a. Locate dimensions on the profile view and between views.
- b. Apply appropriate spacing between the object and the first dimension.
- c. Apply uniform spacing between dimension lines.
- d. Use correct dimension line terminators such as arrowheads ticks, and dots.
- e. Understand and demonstrate tolerance dimensioning.

Objective 2 Understand and appropriately use baseline and chain dimensioning.

Objective 3 Demonstrate an ability to fully dimension a part.

Objective 4 Demonstrate the correct use of leaders and notes.

- a. Understand and correctly form callouts for thru holes, countersinks, counterbores, and spotfaces.
- b. Understand and correctly form callouts for threaded holes.
- c. Understand and correctly form callouts for fillets and rounds.
- d. Demonstrate correct dimensioning for circles, holes, and arcs
- e. Use appropriate angles for leaders.

STANDARD 7

Students will be able to understand and use 2D/3D computer software to create technical drawings.

Objective 1 Use basic measuring systems.

Objective 2 Add correct annotation to drawings.

- a. Use correct lettering techniques and correct text sizes and styles.

Objective 3 Prepare and /or understand title blocks.

Objective 4 Know how to save, open, rename, and move data files using common computer operating system software.

Objective 5 Originate technical drawings using 2D/3D CAD software features.

- a. Create a new drawing setup to support both English and metric drawing standards.
- b. Create drawing setups for different sizes of drawing sheets.
- c. Use and control accuracy enhancement tools.
 - Using snap, grid and positioning methods.
- d. Analyze drawings using the software features.
 - Area, distance, perimeter, X,Y coordinates, etc.

Objective 6 Revise existing technical drawings using the software features.

Objective 7 Reproduce originals using different methods.

- a. Plot to scale and use correct plot specs.
- b. Plot drawings with correct line widths.

Objective 8 Apply the appropriate notes to drawings.

- a. Understand the placement and use of general notes.
- b. Use the correct text height.
- c. Use technical style letters and numerals.

STANDARD 8

Students will be able to manipulate drawings using CAD software.

Objective 1 Utilize geometry editing/modifying commands i.e. trim, extend, fillet, pattern, etc.

Objective 2 Utilize non-geometry editing commands i.e. edit text, spelling, etc.

Objective 3 Control coordinates and origin.

- a. Move the origin to assist in drawing.
- b. Use control coordinates.

STANDARD 9

Students will gain an understanding of Design Technology as a profession and will develop professional skills for the workplace.

Objective 1 As a participating member of the SkillsUSA student organization complete the SkillsUSA Level 1 Professional Development Program.

- a. Complete a self-assessment inventory and identify individual learning styles.
- b. Discover self-motivation techniques and establish short-term goals.
- c. Determine individual time-management skills.
- d. Define future occupations.
- e. Define awareness of cultural diversity and equity issues.
- f. Recognize the benefits of conducting a community service project.
- g. Demonstrate effective communication skills with others.
- h. Participate in a shadowing activity.
- i. Identify components of an employment portfolio.
- j. Explore what is ethical in the workplace or school.
- k. Demonstrate proficiency in program competencies.
- l. Explore what is ethical in the workplace or school.
 - State the SkillsUSA motto.
 - State the SkillsUSA creed.
 - Learn the SkillsUSA colors.
 - Describe the official SkillsUSA dress.
 - Describe the procedure for becoming a SkillsUSA officer.

Objective 2 Understand the use of drawings in technical design and how those drawings relate to career opportunities.

Objective 3 Display a professional attitude toward the instructor and peers.

* SkillsUSA PDP requirements - recommended