Tennessee CTE

Architectural & Engineering Design I

Safety 1

1 Safety Rules: Accurately read, interpret, and demonstrate adherence to safety rules, including but not limited to rules published by the Occupational Safety and Health Administration (OSHA), and state and national code requirements. Be able to distinguish between the rules and explain why certain rules apply. 1.1

2 Safety Equipment: Identify and explain the intended use of safety equipment available in the classroom. Demonstrate how to properly inspect, use, and maintain safe operating procedures with tools and equipment. Incorporate safety procedures and complete safety test with 100 percent accuracy. 1.2

Introduction to Architecture & Engineering Design 2

1 History of Architecture and Engineering: Investigate the history and evolution of architecture and engineering across a variety of civilizations. Identify major innovations, such as technological advances in materials or construction processes. 2.1

2 Contributions of Architects or Engineers: Research and summarize the influences and contributions of a selected architect or engineer giving examples of the individual's completed work to illustrate their impact on society. 2.2

3 Impact of Architects and Engineers: Investigate the social, economic, and environmental impact of decisions made by architects and engineers at the local, national, and global levels. Provide a detailed description of the impacts of a specific discipline, citing links to relevant websites to illustrate the ideas presented. 2.3

4 Sustainable Design: Research the principles of sustainable design. Examine an energy efficient building and determine whether the principles of sustainable design are illustrated in the design of the building. Assess whether the evidence presented is strong enough to support claims of sustainability. 2.4

Career Exploration 3

1 Professions in Architecture and Engineering: Research the major professions in architecture and engineering, such as a civil engineer, mechanical engineer, industrial engineer, electrical engineer, engineering technician, architect, and more. Cite supporting evidence from multiple sources (such as interviews with design professionals retrieved from industry magazines). Analyze career options in architecture and engineering. 3.1

	2 **Career Opportunities: Compile and analyze real-time and projected labor market data from public sources such as the U.S. Bureau of Labor Statistics to investigate local and regional occupational opportunities and trends in architectural and engineering careers. Analyze collected data comparing occupations by job availability, salaries, and benefits.** 3.2
Design Process 4	1 **Design Process: Research design processes used by architects and engineers. Drawing on multiple resources, examine the steps to the design process, synthesizing a range of perspectives on the process as practiced in a variety of architectural and engineering disciplines. Explain why it is an iterative process and always involves refinement.** 4.1
	2 **Evaluate a Design: Evaluate an existing design created by architects and/or engineers using the design process such as a building, landscape, bridge, or product. Describe how the design team likely progressed through each step of the design process citing examples from design magazines and other resources. Examples should include design constraints encountered by the design team and criteria for measuring the effectiveness of the design.** 4.2
Sketching 5	1 **Use of sketching: Investigate the use of sketching in the creative design process. Drawing from resources, explain the tools and techniques used and when architects and engineers apply sketching in the design process.** 5.1
	2 **Freehand Sketches: Create freehand sketches, including rough and refined sketches, demonstrating techniques for sketching freehand lines and circles while attending to accurate proportion. Produce pictorial sketches applying shading techniques. Simulate sketching techniques used by engineers and architects on jobsites. Utilize hand lettering techniques to neatly add notes to the sketches.** 5.2
	3 **Sketching Developing Design Concept: Develop conceptual design ideas using freehand sketching. For example, for a given design problem, generate, analyze, and refine sketches to develop design solutions. Create refined drawings based on sketches of a chosen design.** 5.3
Fundamental Technical Drawing 6	1 **Geometric Constructions: Interpret a technical narrative to understand the steps and tools needed to create geometric constructions such as bisecting a line, angle, or arc; using lines, circles, and arcs to draw a polygon such as a pentagon or hexagon; and constructing tangent and perpendicular relationships. Use geometric terms, illustrations, and supporting texts to describe the steps of creating a geometric construction with accuracy.** 6.1
	2 **Single-View Drawings: Create accurate manual single-view scale drawings of advancing complexity, incorporating symbols, notes, and dimensions, using appropriate layout within title blocks, drawing composition (including line weight and line type), geometric construction techniques, and lettering techniques.** 6.2

3 **Dimensioning Rules: Interpret and apply dimensioning rules to accurately label dimensions on drawings including arranging dimensions, using various dimension styles (such as aligned and angular), and avoiding redundancy.** 6.3

4 **Multi-View Drawings: Create accurate multi-view scale drawings of objects of advancing complexity using orthographic projection. Incorporate symbols, notes, dimensions, and different types of lines (such as hidden lines to show internal or hidden features). Demonstrate procedures to establish a principle view of an object and project from an existing view to create additional views.** 6.4

5 **Isometric Drawings: Building on the knowledge of a single view and multi-view drawing, create simple isometric drawings, properly using lines, labels, and dimensioning techniques.** 6.5

6 **Computer-Aided Drawings (CAD): Interpret instructional material to use CAD software to create simple two-dimensional drawings, accurately incorporating symbols, dimensioning, and line types. Instructional material may include textbooks, manuals, websites, video tutorials, and more. Perform basic operations such as creating files, saving files, opening files, storing files, and printing. Set up the drawing environment by inserting title blocks, applying settings (ortho, snap, etc.), and assigning line weights, line types, and colors.** 6.6

7 **Comparing Techniques: Define the differences in technique among freehand sketching, manual drafting, and computer-aided drafting (CAD). Describe the skills required for each and how each type is used in industry, citing specific examples.** 6.7

8 **Refine Drawings: Demonstrate the ability to refine drawings based on critique from peers, instructors, and self-evaluation.** 6.8

Measurement & Math 7

1 **Math: Apply mathematics concepts to create drawings and solve design problems in this course, distinguishing which principles apply to a given design problem. Concepts should include, but are not limited to:** 7.1

- a Determining and applying the equivalence between fractions and decimals. For example, convert a decimal to a fraction to prepare a unit for measurement on a fractional scale to the precision of 1/16 of an inch. 7.1.A
- b Working with units such as feet, inches, meters, centimeters, and millimeters, and determining appropriate units for a given construction task. For example, convert a dimension from centimeters to inches. 7.1.B
- c Calculating perimeter, area, volume, and surface areas of objects employing related geometric terminology. 7.1.C
- d Performing proportionate reasoning to estimate quantities, such as determining the appropriate scale for a drawing and a given sheet size. 7.1.D
- e Using basic rules of right triangles, such as the Pythagorean Theorem, to find missing lengths. 7.1.E

	2	**Measurement: Use customary and metric measurement systems to complete accurate field measurements. Determine the appropriate units and record accurate measurements of lengths and angles using proper tools. Tools should include, but are not limited to: fractional rule, metric rule, measuring tape, architect's scale, engineer's scale, dial caliper, and protractor.** 7.2
	3	**Measurement in Drawings: Use field measurements to create a drawing, accurately representing the true layout. For example, create a scale drawing of a simple mechanical device by taking field measurements of the device, determining the appropriate scale, and using an engineer's scale to accurately draw the device.** 7.3
Design Project 8	1	**Create Drawings: Use the design process to create a solution for a given design problem, selecting and creating appropriate drawings to explain the solution, including sketches and multiple views of two-dimensional scale drawings.** 8.1
Portfolio 9	1	**Portfolio: Compile materials from coursework to create a portfolio connecting personal career preparation to concepts learned in this course, including written descriptions of drawing types and learning outcomes. Continually review and revise documents, using technology as needed.** 9.1