

Computer Assisted Design

Strand 2: Technical Knowledge and Skills

2.A Drafting Safety Knowledge and Skills

- 2.A.01 Demonstrate an understanding of the importance of wearing safety glasses in setting where hazards are present and on outside job sites.
- 2.A.02 Identify and apply good ergonomic practices as they apply to the work of Drafters, both in shop settings and on outside projects.

2.B Fundamental of Drafting and Design

- 2.B.01 Apply general drafting standards.
 - 2.B.01.01 Identify drawing media and related drafting materials.
 - 2.B.01.02 Annotate a drawing by using basic systems of measurement.
 - 2.B.01.03 Convert between English and metric systems (ISO) of measurement.
 - 2.B.01.04 Identify the alphabet of lines.
 - 2.B.01.05 Prepare title blocks and other drafting formats.
 - 2.B.01.06 Catalog and use number system for documentation and file management.
 - 2.B.01.07 Demonstrate methods used to record revisions.
 - 2.B.01.08 Produce prints, plots and reproductions to appropriate scale.

2.B.01 Performance Example:

- Create a drawing using appropriate format and size. Include proper linetypes, revision, notes, etc. Produce a print to appropriate scale.

2.B.02 Develop views.

- 2.B.02.01 Create orthographic views.
- 2.B.02.02 Create auxiliary views.
- 2.B.02.03 Create section views.
- 2.B.02.04 Create detail views.
- 2.B.02.05 Create isometric views.
- 2.B.02.06 Place views considering first and third angle projection.
- 2.B.02.07 Identify 1, 2, and 3 point perspectives.

2.B.02 Performance Example:

- Given an object, develop a drawing that requires the use of each of the views listed.

2.B.03 Apply the design process.

- 2.B.03.01 Evaluate a problem and develop a solution using the design process.
- 2.B.03.02 Interpret detail prints or technical processes.
- 2.B.03.03 Identify key elements that impact design.

2.B.03 Performance Example:

- Given a product, apply the design process to develop new or revised product. Include documentation for each step of process.

2.C Conventional Drafting Techniques and Skills

- 2.C.01 Create free-hand technical sketches.
 - 2.C.01.01 Letter using block style.
 - 2.C.01.02 Sketch basic concept and/or object proportionately.
 - 2.C.01.03 Make a sketch including detailed measurements/annotations.
 - 2.C.01.04 Sketch a basic object based on “customer” needs.

2.C.01 Performance Example:

- Given an object, sketch appropriate views in proportion with annotations.

- 2.C.02 Apply dimensioning.
- 2.C.02.01 Apply correct dimension line terminators.
 - 2.C.02.02 Apply size and location dimension practices.
 - 2.C.02.03 Apply the use of dimensioning types (ordinate, leader, baseline/datum, chain, tabular).
 - 2.C.02.04 Identify appropriate standard symbols.
 - 2.C.02.05 Apply aligned and unidirectional methods.
 - 2.C.02.06 Apply general notes and/or annotations to a drawing.

- 2.C.02 Performance Example:
- Using an existing drawing, apply appropriate dimensioning standards.

- 2.C.03 Measure, using the tools, knowledge and skills essential to drafting professionals.
- 2.C.03.01 Identify different measurement tools and their applications.
 - 2.C.03.02 Measure parts using engineering, architectural, civil engineering, fractional, metric, and decimal inch scales.
 - 2.C.03.03 Measure parts using vernier caliper and micrometer.
 - 2.C.03.04 Develop drawings utilizing measurements.

- 2.C.03 Performance Example:
- Create an as-built drawing based on actual measurements taken.

2.D Computer Aided Drafting and Design

- 2.D.01 Create CAD template.
- 2.D.01.01 Set up layers/levels.
 - 2.D.01.02 Set up dimension types (units/precision/scale/style/etc.).

- 2.D.01 Performance Example:
- Set parameters for a new drawing based on project requirements.

- 2.D.02 Produce CAD drawing.
- 2.D.02.01 Edit CAD drawing.
 - 2.D.02.02 Manipulate CAD drawing.
 - 2.D.02.03 Extract CAD data (mass/volume/area/etc.).
 - 2.D.02.04 Create 3D models.
 - 2.D.02.05 Create translatable files (pdf, dxf, stl, iges, step, etc.).

- 2.D.02 Performance Example:
- Modify or create model based on requirements, record CAD data and create output file.

2.E Mechanical Drafting and Design

- 2.E.01 Develop sheet metal patterns.
- 2.E.01.01 Identify sheet metal terminology and gauges.
 - 2.E.01.02 Develop basic shapes using radial line and parallel line development.
 - 2.E.01.03 Develop a flat pattern for precision bending.

- 2.E.01 Performance Example:
- Using a discarded product such as a milk carton or shoe box, create a full size pattern drawing.

- 2.E.02 Detail and Dimension Weldment.
- 2.E.02.01 Identify welding processes.
 - 2.E.02.02 Identify various types of welded joints.
 - 2.E.02.03 Apply welding symbols to a drawing.

- 2.E.02 Performance Example:
- Convert a cast part to a weldment using various symbols and processes.

- 2.E.03 Identify manufacturing processes.
- 2.E.03.01 Identify casting, forging, molding, extruding, machining, metal fabrication, and welding, etc. procedures.

2.E.03 Performance Example:

- Students create a presentation and assessment questions on one or more processes.

- 2.E.04 Produce mechanical drawings.
- 2.E.04.01 Draw detail drawings.
- 2.E.04.02 Draw assembly drawings.
- 2.E.04.03 Draw layout drawings.
- 2.E.04.04 Incorporate appropriate specification details using resources (standard/purchased items, machinery's handbooks, ASTM and ANSI standards, etc.).
- 2.E.04.05 Apply dual dimensioning for product and/or manufacturing drafting needs.

2.E.04 Performance Example:

- Create a layout, detail and assembly drawing for a simple product (pen, depth gauge, etc.)

- 2.E.05 Apply tolerances.
- 2.E.05.01 Identify tolerancing terminology.
- 2.E.05.02 Dimension with a consideration for tolerance stack-ups.
- 2.E.05.03 Calculate clearance and interference fit tolerance of mating parts using tables (RC, LN, FN, LT, LC).
- 2.E.05.04 Apply tolerance to dimensions using unilateral, bilateral and limits.
- 2.E.05.05 Apply geometric tolerance symbols.
- 2.E.05.06 Determine location of datum symbols.
- 2.E.05.07 Identify and apply surface (finish) control to part surfaces.

2.E.05 Performance Example:

- Create detail and assembly drawing with consideration of mating part fit.

- 2.E.06 Differentiate mechanical components.
- 2.E.06.01 Identify breaks, joints, couplings, bearings, clutches, belts, chains, gears, cams, etc.
- 2.E.06.02 Identify different types of fasteners (e.g., screws, nuts, rivets, springs, keys, pins, washers, etc.).
- 2.E.06.03 Specify thread nomenclature, series, classifications, and fits and forms.

2.E.06 Performance Example:

- Students create a presentation and assessment questions on one or more components.

- 2.E.07 Identify electro-mechanical drawings.
- 2.E.07.01 Identify basic electric/electronic components and symbols used in drafting.
- 2.E.07.02 Identify a schematic, wiring diagram, circuit diagram, and cable/harness drawings.

2.E.07 Performance Example:

- Interpret an existing diagram identifying appropriate symbols.

2.F Architectural Drafting and Design

- 2.F.01 Identify building types.
- 2.F.01.01 Distinguish between commercial, residential, and industrial construction.

2.F.01.02 Recognize the architectural styles of buildings.

2.F.01 Performance Example:

- Students create a presentation and assessment questions on building types and styles.

2.F.02 Draw construction drawings.

2.F.02.01 Select appropriate references (building codes, ADA, Architectural Graphic Standards, etc.).

2.F.02.02 Draw a plot plan considering civil engineering principles.

2.F.02.03 Draw floor plans (considering appropriate room planning: service, sleeping, and living areas).

2.F.02.04 Draw foundation plan (footings, etc.).

2.F.02.05 Draw interior/exterior elevations.

2.F.02.06 Draw sections.

2.F.02.07 Draw details (framing, window, door, etc.).

2.F.02.08 Draw roof plan.

2.F.02.09 Incorporate door, window and finish schedules.

2.F.02.10 Interpret electrical, plumbing, fireplace, exhaust, and HVAC drawings.

2.F.02.11 Calculate, develop, and layout stairs.

2.F.02.12 Create a set of the above drawings listed as they apply to one building / residence.

2.F.02.13 List common construction material sizes/lengths and describe how these constraints should be considered in design.

2.F.02 Performance Example:

- Produce plans for a simple single-story residence.

2.G Sustainability

2.G.01 Recognize Green Design.

2.G.01.01 Identify product design requirements.

2.G.01.02 Identify architectural design requirements (e.g., (LEED) Leadership in Energy and Environmental Design).

Third Year Drafting

Listed below are additional Categories of Learning, Standards and Objectives beyond the scope of the two year DESE requirement. They are placed in Supplemental Activities and can be used in the third year of a Drafting and Design Technology program.

2.H* ARCHITECTURAL DRAFTING AND DESIGN – *Supplemental Activities*

2.H.01* Calculate dead, live, snow and wind loads on the designed residential house.

2.H.01.01* Determine the tributary area of structural elements on the designed residential house.

2.H.01.02* Trace loads through the building to the foundation.

2.H.02* Redesign a parking lot.

2.H.02.01* Survey an existing parking lot.

2.H.02.02* Redesign the parking lot for maximum usage.

2.H.02.03* Estimate the cost of the redesign of the parking lot.

2.H.03* Determine the heat loss of the designed residential house.

2.H.04* Identify elements of civil design.

- 2.H.04.01* Describe materials and properties used in civil design.
- 2.H.04.02* Identify common civil symbols.
- 2.H.04.03* Identify zoning, environmental, and other regulations and guidelines that impact development.
- 2.H.04.04* Identify surveying instruments.
- 2.H.04.05* Plot using bearings, distances, and coordinates.
- 2.H.04.06* Place utilities, accesses, and contours within size and specifications as described in code.
- 2.H.04.07* Determine acreage.

2.I* COMPUTER AIDED DRAFTING AND DESIGN – *Supplemental Activities*

- 2.I.01* Set up CAD drawing format