Drafting II

8531 36 weeks / 280 hours

Table of Contents

Acknowledgments ......................................................................................................................................... 1
Course Description ........................................................................................................................................ 2
Task Essentials List ....................................................................................................................................... 2
Curriculum Framework ................................................................................................................................. 3
Practicing Safety ........................................................................................................................................... 4
Performing Mechanical Drafting and Design Operations with Extensive Use of Computer-Aided Drafting and Design (CADD) ........................................................................................................... 5
Preparing a Career Portfolio ....................................................................................................................... 20
Obtain an Industry Certification by Examination ....................................................................................... 22
SOL Correlation by Task ............................................................................................................................ 23
Entrepreneurship Infusion Units ................................................................................................................. 24
Appendix: Credentials, Course Sequences, and Career Cluster Information ............................................. 26

Acknowledgments

The components of this instructional framework was developed by the following business panel team member:

   Winnie Ma Sung, Director of Quality, Glavé & Holmes Architecture; Richmond, Virginia

The following educators served on the Curriculum Development team:

   Cathy M. Cropp, King George High School, King George County Schools
   James T. Irby, Blacksburg High School, Montgomery County Public Schools
   Robert E. Jett, Stafford High School, Stafford County Public Schools
   Jacob Colin Leonard, Page County High School, Page County Public Schools
   Laura P. Smith, Washington County Career and Technical Education Center, Washington County Public Schools

The framework was edited and produced by the CTE Resource Center:
Course Description

Suggested Grade Level: 11 or 12
Prerequisites: 8530

Building on competencies taught in Drafting I, students master the theory and manipulative skills necessary to produce complete and accurate drawings based on the ideas and sketches of engineers, architects, and designers. Students focus on performing mechanical drafting and design operations, using manual drafting techniques and Computer Aided Drafting and Design (CADD), and explore careers in drafting including industry certification options.

Task Essentials List

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (*) are sensitive.

<table>
<thead>
<tr>
<th>Task Number</th>
<th>8531</th>
<th>Tasks/Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>⊕</td>
<td>Follow general safety procedures.</td>
</tr>
<tr>
<td>40</td>
<td>⊕</td>
<td>Adjust equipment for maximum comfort and usability.</td>
</tr>
<tr>
<td>41</td>
<td>⊕</td>
<td>Describe ergonomic considerations.</td>
</tr>
<tr>
<td>42</td>
<td>⊕</td>
<td>Prepare primary auxiliary views.</td>
</tr>
<tr>
<td>43</td>
<td>⊕</td>
<td>Prepare secondary auxiliary views.</td>
</tr>
<tr>
<td>44</td>
<td>⊕</td>
<td>Prepare sectional views (removed, revolved, aligned, and broken-out).</td>
</tr>
<tr>
<td>Task Number</td>
<td>Tasks/Competencies</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Prepare drawings of threads and fasteners.</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Use reference materials.</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Develop patterns, including radial and parallel line patterns.</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Apply mechanical symbols to a drawing.</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Apply dual dimensioning to a drawing.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Apply datum (ordinate) dimensioning to a drawing.</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Identify symbols for geometric dimensioning and tolerancing.</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Apply Geometric Dimensioning and Tolerancing (GD&amp;T) to a drawing.</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Apply formulas for gear design.</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Prepare a drawing of a gear.</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Prepare a drawing of a cam.</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Prepare a line drawing of a linked mechanism.</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Identify welding symbols and processes.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Apply welding symbols to a drawing.</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Identify manufacturing processes.</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Prepare a parts list for an assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Prepare an orthographic assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Prepare an exploded assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Prepare a working drawing, to include assembly and detailed drawings, of a multi-component mechanical device.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Identify the difference between parametric and non-parametric CADD models.</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Prepare an electrical schematic.</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Reproduce drawings.</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Create a 3-D model, using CADD.</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Document a 3-D CADD model design.</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Plot a documented 3-D CADD model.</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Compile a professional drafting portfolio.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Gather material for a portfolio.</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Organize a portfolio.</td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Prepare for an industry-certification exam.</td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Take an industry-certification exam.</td>
<td></td>
</tr>
</tbody>
</table>

**Curriculum Framework**
Practicing Safety

Task Number 39

Follow general safety procedures.

Definition

Following general safety procedures is demonstrated by

- safe handling of all tools, equipment, and furniture
- adherence to safety precautions regarding Computer-Aided Design and Drafting (CADD) electrical equipment
- adherence to classroom regulations
- familiarity with school emergency plans.

Process/Skill Questions

- How does safe handling of tools, equipment, and furniture benefit job performance?
- What potential safety hazards exist with electrical equipment?
- What are some consequences of ignoring conduct regulations in the workplace?

Task Number 40

Adjust equipment for maximum comfort and usability.

Definition

Adjustment for comfort and usability can be ensured by a routine check of equipment settings. Students should know when it is necessary to make adjustments to the

- computer monitor
- drawing table
- lights
- chair.

Process/Skill Questions

- What are some consequences of improperly adjusted equipment?
- Why is it necessary to perform routine checks of equipment settings?
- How can an improperly adjusted chair affect the work of a drafter?
Task Number 41

Describe ergonomic considerations.

Definition

Description should address comfort, fatigue, and health-related concerns, and should include classroom considerations such as

- keyboard position
- chair position
- screen position
- lighting levels
- adaptable lighting control
- body posture and position of arms, wrists, and hands when using the keyboard, mouse, and other equipment.

Process/Skill Questions

- What medical problems can result from a lack of ergonomic considerations?
- How do the ergonomic considerations of a manual drafter differ from those of a CADD operator?
- Can a setting that a person considers comfortable be harmful ergonomically? Explain.

Performing Mechanical Drafting and Design Operations with Extensive Use of Computer-Aided Drafting and Design (CADD)

Task Number 42

Prepare primary auxiliary views.

Definition

Preparation should include

- choosing the primary orthographic view from which the auxiliary view is projected
- demonstrating that the edge view of the inclined surface is perpendicular to one of the three principal planes
• creating a projection plane parallel to the inclined surface
• defining the true length, depth, or height in the primary (orthographic) view
• defining the true shape of the auxiliary view
• annotating all views.

Process/Skill Questions

• What is the purpose of creating auxiliary views of inclined surfaces?
• How is the true length, depth, or height in the primary (orthographic) view defined?
• How is the true shape of the auxiliary view defined?

Task Number 43

Prepare secondary auxiliary views.

Definition

Preparation should include

• choosing the primary orthographic view from which the auxiliary view is projected
• demonstrating that the edge view of the inclined surface is not perpendicular to any of the three principal planes
• creating the point view of a true-length line
• creating an edge view of the auxiliary surface, using the point view
• defining true length, depth, or height in the primary (orthographic) view
• defining true shape of the auxiliary view
• annotating all views.

Process/Skill Questions

• What is another name for a surface not perpendicular to any of the principal planes?
• What practical application may require the construction of a secondary auxiliary view?

Task Number 44

Prepare sectional views (removed, revolved, aligned, and broken-out).

Definition
Preparation should include

- choosing the orthographic view from which the section will be taken
- showing the location of the cutting-plane line (aligned and removed sections only)
- determining whether to show breaks (revolved sections only)
- determining the depth of cut
- revolving features into the drawing plane that are not crossed by the cutting plane (i.e., aligned section)
- determining whether to show removed sections on a larger scale
- labeling section views.

Process/Skill Questions

- What feature or linetype does a cutting-plane line usually pass over?
- What is the proper line weight and linetype of a cutting-plane line?
- What is the purpose of drawing section views?
- What type of section views would be used in the construction of a submarine (or other practical object)?

Task Number 45

Prepare drawings of threads and fasteners.

Definition

Preparation requires selection of types of

- threads and fasteners, based upon construction materials and situation
- thread and fastener callouts (metric and U.S. customary units)
- drawings (detailed, schematic, and simplified).

Process/Skill Questions

- What are the benefits of being able to identify various thread types?
- In what types of situations is it necessary to provide drawings of threads and fasteners?

Task Number 46

Use reference materials.
Definition

Use may include

- American National Standards Institute (ANSI) manuals
- International Standards Organization (ISO) manuals
- building code manuals
- machinist handbooks.

Process/Skill Questions

- When might it be necessary to consult reference material?
- What are some successful methods of using reference materials?

Task Number 47

Develop patterns, including radial and parallel line patterns.

Definition

Development of radial patterns requires an understanding of the properties of cones and pyramids. Parallel line pattern development requires an understanding of prisms and cylinders. Pattern development is often used to indicate fold or bend lines in flat drawings of sheet metal products (e.g., heating, ventilation, and air conditioning (HVAC) ducts, filing cabinets).

Process/Skill Questions

- What industries might use pattern development drawings?
- How are parallel and radial developments different?
- How is a radial pattern developed from a cone?

Task Number 48

Apply mechanical symbols to a drawing.

Definition

Application should include
• machine-processing symbols (e.g., diameter, radius, counterbore, countersink, depth, finish)
• welding symbols (e.g., fillet, spot, plug).

**Process/Skill Questions**

• What are the benefits of using a recognized set of symbols?
• What are some consequences of using incorrect symbols?

---

**Task Number 49**

**Apply dual dimensioning to a drawing.**

**Definition**

Application should include

• choosing two different units for dimension values
• converting one unit to another (e.g., inches to millimeters)
• showing consistent labeling of dual dimensions on a drawing (e.g., inches [millimeters] or inches/millimeters)
• using consistent decimal precision for the two units
• clearly noting the units used on the drawing.

**Process/Skill Questions**

• Why would dual dimensions be required for a drawing?
• Inches and millimeters are the most common dual-dimensioned units. What other units of measurement might be used?

---

**Task Number 50**

**Apply datum (ordinate) dimensioning to a drawing.**

**Definition**

Application should include

• choosing datum location(s)
• placing datum symbol
• determining features to include in the dimensioning
  • selecting appropriate units and level of precision.

Process/Skill Questions

• What is the advantage of datum-dimensioning versus chain-dimensioning techniques?
• What is an example of a situation that would require more than datum?

Task Number 51

Identify symbols for geometric dimensioning and tolerancing.

Definition

Identification should include

• all geometric dimensioning and tolerancing symbols specified in the American Society of Mechanical Engineers (ASME) Standard ASME Y14.5M-2009
• feature control frame configuration.

Process/Skill Questions

• What are the benefits of using a recognized set of symbols?
• What is the ASMEY14.5-2009 Standard? Who administers this standard?
• What are the benefits of establishing a set of standards for Geometric Dimensioning and Tolerancing (GD&T)?

Task Number 52

Apply Geometric Dimensioning and Tolerancing (GD&T) to a drawing.

Definition

Application should include

• establishing datum location(s)
• distinguishing between the concepts illustrated by each symbol
• placing symbol(s) and the feature control frame on the drawing.

Process/Skill Questions

• Why is the location of the datum so important to the process of applying GD&T symbols?
• What is the difference between maximum material condition and least material condition as they relate to holes? To solid features?

Task Number 53

Apply formulas for gear design.

Definition

Application should include

• identifying the different types of gears
• establishing a gear ratio
• using gear terminology
• calculating cutting data
• presenting the data in tabular form.

Process/Skill Questions

• What are some practical applications for gears?
• What is diametral pitch?
• What type of power transmission requires a bevel gear system?
• If a drive gear has 30 teeth and the driven gear has 10 teeth, what is the gear ratio?

Task Number 54

Prepare a drawing of a gear.

Definition

Preparation should include

• choosing the type of gear to draw
• establishing a gear ratio
• calculating the cutting data
• plotting the involute curve shape of the tooth from cutting data
• drawing the gear to scale in schematic or detailed form
• presenting the cutting data in tabular form
• specifying a shaft and keyway.

Process/Skill Questions

• What is the difference between a schematic and a detailed gear drawing?
• Why is it important to present the cutting data in tabular form with the gear drawing?
• From what materials are gears typically manufactured?

Task Number 55

Prepare a drawing of a cam.

Definition

Preparation should include

• choosing the type of cam
• using cam terminology
• selecting one of the four types of cam followers
• plotting a displacement diagram
• laying out the shape of the cam to scale, using the displacement diagram
• plotting the involute curve shape of the tooth from cutting data
• dimensioning the cam.

Process/Skill Questions

• What are some practical applications of a cam?
• What are the four types of cam followers?
• What types of motion are transferred between the cam and the cam follower?

Task Number 56

Prepare a line drawing of a linked mechanism.

Definition
Preparation should include

- selecting the type of linked mechanism
- using terminology specific to linked mechanisms
- using established schematic symbols to represent moving and stationary features
- laying out the mechanism’s stroke, oscillation, and/or revolution to scale
- plotting the extremities of the mechanism’s stroke, oscillation, and/or revolution
- dimensioning the drawing to display the mechanism’s extremities.

**Process/Skill Questions**

- What are the basic forms of mechanical motion?
- Is accuracy as important with schematic line drawings as it is with working drawings? Why or why not?

---

**Task Number 57**

**Identify welding symbols and processes.**

**Definition**

Identification should include

- describing the six major types of welds
- describing the five major types of welded joints
- interpreting the components of a basic welding symbol
- describing the placement of welding process symbols and specifications on a basic welding symbol.

**Process/Skill Questions**

- What is/are the advantage(s) of welding over threaded mechanical fasteners such as bolts?
- What differentiates the basic welding symbol from the standard leader?

---

**Task Number 58**

**Apply welding symbols to a drawing.**

**Definition**
Application should include

- establishing weld and joint location(s)
- determining the side of the view to place the basic weld symbol
- adhering to proper placement of the welding process symbol on the basic weld symbol
- placing welding process specifications on the basic weld symbol.

Process/Skill Questions

- What does the location of the welding process symbol on the basic weld symbol (leader) tell the welder?
- What types of materials may be joined by welding?
- Where on the basic weld symbol is the welding process specified?

---

Task Number 59

Identify manufacturing processes.

Definition

Identification should include

- describing the metal and nonmetal engineering materials
- describing the different processes used to transform engineering materials into a finished product
- explaining additive manufacturing (3-D printing)
- describing the concepts of jigs and fixtures
- explaining the use of robotics
- explaining the use of Computer Numerical Control (CNC) machines
- defining computer-aided manufacturing (CAM).

Process/Skill Questions

- What are the roles of computers in today’s manufacturing processes?
- What advantages/disadvantages do nonmetal engineering materials such as composites have vs. metal engineering materials?
- Why is accuracy so important in the construction of jigs and fixtures?

---

Task Number 60
Prepare a parts list for an assembly drawing.

Definition

Preparation should include selecting information to include on the tabular parts list, including the following:

- Part identification number (to match the indicated part on the assembly drawing)
- Part name or description
- Materials used to manufacture part
- Number of each part required (for one assembly)

Process/Skill Questions

- What other information may be included on the parts list, in addition to the four major items?
- How does the parts list assist the machinist?

Task Number 61

Prepare an orthographic assembly drawing.

Definition

Preparation should include

- accessing detailed drawings of the assembly's individual parts
- determining how the detailed parts are assembled
- assigning part numbers to each unique part
- choosing a scale
- determining the orthographic views necessary to best describe the assembly
- determining if a section view is necessary
- centering the views on the sheet
- adding necessary dimensions
- showing/providing a parts list.

Process/Skill Questions

- Why is it important to assign part numbers to each unique part of the assembly?
- What special considerations are needed for a section view through an assembly?
- What dimensions are necessary for an assembly drawing?
Task Number 62

Prepare an exploded assembly drawing.

Definition

Preparation should include

- accessing detailed drawings of the assembly's individual parts
- determining how the detailed parts are assembled
- choosing a projection method (orthographic or pictorial)
- choosing a trail line or lines that separate each part from the assembly
- assigning part numbers to each unique part
- choosing a scale
- centering the view on the sheet
- showing/providing a parts list.

Process/Skill Questions

- Why are dimensions not necessary for an exploded assembly drawing?
- How does an exploded assembly drawing assist the fabricator or machinist?
- How can an exploded assembly drawing assist a consumer?

Task Number 63

Prepare a working drawing, to include assembly and detailed drawings, of a multi-component mechanical device.

Definition

Preparation should include

- accessing dimensioned sketches and/or actual parts of a mechanical assembly
- preparing dimensioned orthographic drawings of each individual part
- assigning each part an identification number
- preparing an orthographic assembly drawing with parts list
- preparing an exploded assembly drawing with parts list.

Process/Skill Questions
• Why are dimensional and annotation standards important for working drawings?
• How are sub-assembly drawings incorporated into a working drawing?

Task Number 64

Identify the difference between parametric and non-parametric CADD models.

Definition

Identification should include

• defining parameter
• describing how parametric modeling is dimension-based while non-parametric is not.

Process/Skill Questions

• What are the names of some proprietary parametric CADD software? Non-parametric CADD?
• What advantages/disadvantages does parametric CADD software have vs. non-parametric CADD software?

Task Number 65

Prepare an electrical schematic.

Definition

Preparation should include

• choosing a sheet size
• choosing to draw the schematic to scale or not to scale
• centering the drawing on the sheet
• laying out the schematic with proper line weights and notes
• adding a legend to identify the symbols.

Process/Skill Questions
- Why is scale not as important for electrical schematics as it is for other working drawings?
- Why are varied line weights used for schematics?

Task Number 66

Reproduce drawings.

Definition

Reproduction should include

- having the drawing on the proper medium for the reproduction process
- choosing the type of reproduction process
- placing the drawing in the input area of the reproduction device
- setting the reproduction device for a desired number of copies and image density
- retrieving copies from the device’s output area.

Process/Skill Questions

- What is the difference between whiteprinting and blueprinting?
- What is the difference between whiteprinting and the modern xerographic process?
- Why is the process of blueprinting seldom used in modern industry?

Task Number 67

Create a 3-D model, using CADD.

Definition

Creation should include

- selecting a 3-D CADD software application
- creating 2-D geometry
- using commands to transform 2-D geometry into 3-D objects
- creating a 3-D object, using built-in primitive solids
- using 3-D commands to modify the 3-D model
- viewing the model from different perspectives
- saving the 3-D model.
Process/Skill Questions

- How do 3-D models affect the generation of paper drawings?
- How are 3-D models used in testing products?
- How can 3-D models improve the economics of a design firm?

Task Number 68

Document a 3-D CADD model design.

Definition

Documentation should include

- creating or selecting an existing 3-D CADD model
- selecting a sheet size
- choosing an appropriate scale
- inserting the desired 3-D model’s views on the sheet
- adding annotation and dimensions as required
- saving the file
- printing the file (2-D, 3-D).

Process/Skill Questions

- Why is it important to have a documented drawing of a 3-D model?

Task Number 69

Plot a documented 3-D CADD model.

Definition

Plotting should include

- creating or selecting an existing documented 3-D CADD model
- selecting a plotter or other output device configured to the plotting computer
- setting the plot scale to match the document’s scale
- setting image quality and sheet layout
- previewing the printed drawing
- printing the drawing to the output device.
Process/Skill Questions

- Why are paper drawings still requested by fabricators and manufacturers?
- What other media, besides paper, may be used for printing?

Task Number 70
Create a 3-D printed model.

Definition
Creation should include
- converting 3-D CADD model to output format for 3-D printed model
- using 3-D printer software to set up and produce the model.

Process/Skill Questions

- What are some things students can create with 3-D modeling/printers?
- What are some cross-curriculum projects that are inspired by 3-D models?

Preparing a Career Portfolio

Task Number 71
Compile a professional drafting portfolio.

Definition
Compilation should include portfolio material presented in

- three-ring binder bound volume
- diary or journal
- manila folder
- flat portfolio
- electronic portfolio
- slideshow presentation
- web pages.

Discussion of the portfolio should include its role in the hiring process.

Process/Skill Questions
• What are some advantages of including a wide variety of work in the portfolio? What are some disadvantages?
• How does the portfolio represent the history of a student’s development as a drafter?
• How does planning a portfolio for submission to a prospective employer differ from planning a portfolio for submission to a teacher for a particular project?

Task Number 72
Gather material for a portfolio.
Definition
Gathering products (e.g., drawings, pictures of models) representing a variety of projects should demonstrate the range of the drafter's talent. The portfolio should also include

• résumé
• cover letter
• references
• letters of recommendation
• certifications.

Process/Skill Questions

• What are some strategies for writing a successful cover letter?
• How does one decide which work to include in a portfolio?
• What are some resources for résumé writing help?
• Who are good sources for letters of recommendation?

Task Number 73
Organize a portfolio.
Definition
Organization of portfolio should include an index, and work should be organized into sections labeled by subject areas. Possible sections include

• architectural drawings
• mechanical drawings
• manual drawings
- projects
- certifications
- awards and recognition (e.g., SkillsUSA, academic, professional)
- general (résumé, cover letter, letters of recommendation).

Process/Skill Questions

- How can an unorganized portfolio be detrimental?
- What might a disorderly portfolio lead a prospective employer or client to conclude about a candidate?

Task Number 74

Present a portfolio.

Definition

Presentation may involve a variety of methods, including a slide show, web-based presentation, or manual browsing of the portfolio’s contents. The presenter must remain professional and possess strong communication skills.

Process/Skill Questions

- How do strong communication skills improve the portfolio presentation?
- What are some consequences of a lengthy presentation?
- What are some considerations when preparing for the presentation?

Obtain an Industry Certification by Examination

Task Number 75

Prepare for an industry-certification exam.

Definition

Preparation should include

- consulting with parent(s)/guardian(s), teacher(s), counselor(s), peer(s), and industry professional(s) to consider the primary exam/certification options
• choosing the industry exam to be taken
• obtaining and studying available training materials
• ensuring prior training aligns with exam items
• taking pre-tests or practice exams, if possible
• strengthening performance by using exam-specific study aids, review guides, and referenced textbooks.

Process/Skill Questions

• What certification exams are related or available to drafters?
• What is a passing score for the various exams?
• What benefits does an industry certification provide to a drafter?

Task Number 76

Take an industry-certification exam.

Definition

Taking the exam should include

• establishing the time, date, and location of exam
• registering and paying for the exam, scores, and any additional fees
• securing a proctor, if necessary
• securing technical assistance for online exams, if necessary
• establishing a procedure for sending exams to the evaluator, if necessary.

Process/Skill Questions

• What are the industry-relevant certifications and study-aid materials related to drafting?
• How does one adequately prepare for the certification exam?
• How do career goals relate to certification goals?

SOL Correlation by Task

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Subject Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Follow general safety procedures.</td>
<td>History and Social Science: GOVT.16</td>
</tr>
<tr>
<td>40</td>
<td>Adjust equipment for maximum comfort and usability.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>42</td>
<td>Prepare primary auxiliary views.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Task Description</td>
<td>Mathematics:</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>43</td>
<td>Prepare secondary auxiliary views.</td>
<td>G.3, G.14</td>
</tr>
<tr>
<td>44</td>
<td>Prepare sectional views (removed, revolved, aligned, and broken-out).</td>
<td>G.3, G.14</td>
</tr>
<tr>
<td>45</td>
<td>Prepare drawings of threads and fasteners.</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Use reference materials.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>47</td>
<td>Develop patterns, including radial and parallel line patterns.</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Apply mechanical symbols to a drawing.</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Apply dual dimensioning to a drawing.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Apply datum (ordinate) dimensioning to a drawing.</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Identify symbols for geometric dimensioning and tolerancing.</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Apply Geometric Dimensioning and Tolerancing (GD&amp;T) to a drawing.</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>Apply formulas for gear design.</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Prepare a drawing of a gear.</td>
<td>G.12</td>
</tr>
<tr>
<td>55</td>
<td>Prepare a drawing of a cam.</td>
<td>G.12</td>
</tr>
<tr>
<td>56</td>
<td>Prepare a line drawing of a linked mechanism.</td>
<td>G.3</td>
</tr>
<tr>
<td>57</td>
<td>Identify welding symbols and processes.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>58</td>
<td>Apply welding symbols to a drawing.</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Identify manufacturing processes.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>60</td>
<td>Prepare a parts list for an assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Prepare an orthographic assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Prepare an exploded assembly drawing.</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Prepare a working drawing, to include assembly and detailed drawings, of a multi-component mechanical device.</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Identify the difference between parametric and non-parametric CADD models.</td>
<td>English: 11.3, 11.5, 12.3, 12.5</td>
</tr>
<tr>
<td>65</td>
<td>Prepare an electrical schematic.</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Reproduce drawings.</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Create a 3-D model, using CADD.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>68</td>
<td>Document a 3-D CADD model design.</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Plot a documented 3-D CADD model.</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Create a 3-D printed model.</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Compile a professional drafting portfolio.</td>
<td>English: 11.6, 12.6</td>
</tr>
<tr>
<td>72</td>
<td>Gather material for a portfolio.</td>
<td>English: 11.6, 12.6</td>
</tr>
<tr>
<td>73</td>
<td>Organize a portfolio.</td>
<td>English: 11.6, 12.6</td>
</tr>
<tr>
<td>74</td>
<td>Present a portfolio.</td>
<td>English: 11.1, 12.1</td>
</tr>
<tr>
<td>75</td>
<td>Prepare for an industry-certification exam.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>76</td>
<td>Take an industry-certification exam.</td>
<td>English: 11.5, 12.5</td>
</tr>
</tbody>
</table>

**Entrepreneurship Infusion Units**
Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked “optional.” Teachers can find the infusion/unit in the course listing.
Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- Architectural Apprentice Drafter Examination
- Architectural Certified Drafter Examination
- Architectural Drafting Assessment
- Architectural Drafting Examination
- Autodesk Certified Professional Examinations
- Autodesk Certified User Examinations
- CAD Assessment
- CAD-CAM Assessment
- Certified SOLIDWORKS Associate (CSWA) Examination
- College and Work Readiness Assessment (CWRA+)
- Customer Service Examination
- Customer Service Specialist (CSS) Examination
- ICC Certificates of Completion Examinations
- International Code Council Residential Building Inspector (B1) Examination
- Mechanical Apprentice Drafter Examination
- Mechanical Certified Drafter Examination
- Mechanical Drafting and Design Assessment
- National Career Readiness Certificate Assessment
- Professional Communications Certification Examination
- Technical Drafting Assessment
- Technical Drafting Examination
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.

- Drafting I (8530/36 weeks, 140 hours)

**Career Cluster: Architecture and Construction**

<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
</table>
| Design/Pre-Construction | Architect  
<p>|                       | Architectural Drafter    |</p>
<table>
<thead>
<tr>
<th>Pathway</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering and Technology</td>
<td>Aeronautical Drafter</td>
</tr>
<tr>
<td></td>
<td>Architect</td>
</tr>
<tr>
<td></td>
<td>Electrical Drafter</td>
</tr>
<tr>
<td></td>
<td>Electronic Drafter</td>
</tr>
<tr>
<td></td>
<td>Mechanical Drafter</td>
</tr>
</tbody>
</table>