Introduction to Computer Aided Design and Drafting

Subject: Career and Technical Education
Grade: 09
Expectations: 94
Breakouts: 181

(a) Introduction.

1. Career and technical education instruction provides content aligned with challenging academic standards, industry-relevant technical knowledge, and college and career readiness skills for students to further their education and succeed in current and emerging professions.

2. The Science, Technology, Engineering, and Mathematics (STEM) Career Cluster focuses on planning, managing, and providing scientific research and professional and technical services, including laboratory and testing services, and research and development services.

3. Introduction to Computer-Aided Design and Drafting (CADD) allows students to acquire knowledge and skills needed to use design software, including an introduction to CADD equipment and software selection and interfaces. Students gain skills in setting up a CADD workstation; upgrading a computer to run advanced CADD software; working with storage devices; storing, retrieving, backing-up, and sharing databases, file servers, and local area networks (LANs); and transferring drawing files over the internet.

4. Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.

5. Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(b) Knowledge and Skills Statements

(1) The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:

(A) describe the roles, responsibilities, and dynamics of a team as applied in appropriate industry fields;

(i) describe the roles of a team as applied in appropriate industry fields

(ii) describe the responsibilities of a team as applied in appropriate industry fields

(iii) describe the dynamics of a team as applied in appropriate industry fields

(B) explain employers' work expectations;

(i) explain employers' work expectations

(C) use effective and accurate architectural or engineering vocabulary throughout design and drafting process;

(i) use effective architectural or engineering vocabulary throughout design process

(ii) use effective architectural or engineering vocabulary throughout drafting process

(iii) use accurate architectural or engineering vocabulary throughout design process

(iv) use accurate architectural or engineering vocabulary throughout drafting process

(D) demonstrate knowledge of the concepts and skills related to health in the workplace; and

(i) demonstrate knowledge of the concepts related to health in the workplace

(ii) demonstrate knowledge of the skills related to health in the workplace

(E) demonstrate safety in the workplace as specified by appropriate governmental regulations.

(i) demonstrate safety in the workplace as specified by appropriate governmental regulations

(2) The student demonstrates knowledge of the CADD software. The student is expected to:

(A) describe computer-aided design, drafting, and CADD applications;

(i) describe computer-aided design applications

(ii) describe computer-aided drafting applications

(iii) describe CADD applications

(B) demonstrate how to start and exit CADD software without corrupting files;

(i) demonstrate how to start CADD software without corrupting files

(ii) demonstrate how to exit CADD software without corrupting files

(C) use draw files;

(i) use draw files

(D) save, close, and open saved files;

(i) save files

(ii) close files

(iii) open saved files

(E) determine and specify drawing units and limits;

(i) determine drawing units

(ii) determine drawing limits

(iii) specify drawing units

(iv) specify drawing limits

(F) describe and use the Cartesian coordinate system;

(i) describe the Cartesian coordinate system

(ii) use the Cartesian coordinate system

(G) use drawing snap and grid functions; and

(i) use drawing snap functions

(ii) use drawing grid functions

(H) demonstrate the use of dynamic input and the command line.

(i) demonstrate the use of dynamic input

(ii) demonstrate the use of the command line

(3) The student demonstrates the use of CADD tools for basic drawing and plotting. The student is expected to:

(A) draw objects using the line tool;

(i) draw objects using the line tool

(B) draw circles, arcs, ellipses, and elliptical arcs;

(i) draw circles

(ii) draw arcs

(iii) draw ellipses

(iv) draw elliptical arcs

(C) draw polylines, rectangles, donuts, and filled circles;

(i) draw polylines

(ii) draw rectangles

(iii) draw donuts

(iv) draw filled circles

(D) draw true spline curves;

(i) draw true spline curves

(E) create drawing templates;

(i) create drawing templates

(F) describe basic line conventions;

(i) describe basic line conventions

(G) create and manage layers;

(i) create layers

(ii) manage layers

(H) draw objects on separate layers;

(i) draw objects on separate layers

(I) print and plot drawings;

(i) print drawings

(ii) plot drawings

(J) demonstrate organizational skills to influence the sequential process when creating drawings;

(i) demonstrate organizational skills to influence the sequential process when creating drawings

(K) construct geometric figures of lines, splines, circles, and arcs;

(i) construct geometric figures of lines

(ii) construct geometric figures of splines

(iii) construct geometric figures of circles

(iv) construct geometric figures of arcs

(L) create and edit text using appropriate style and size to annotate drawings;

(i) create text using appropriate style to annotate drawings

(ii) create text using appropriate size to annotate drawings

(iii) edit text using appropriate style to annotate drawings

(iv) edit text using appropriate size to annotate drawings

(M) use control accuracy enhancement tools for entity positioning methods such as snap and xyz;

(i) use control accuracy enhancement tools for entity positioning methods

(N) use editing commands;

(i) use editing commands

(O) use viewing commands to perform zooming and panning;

(i) use viewing commands to perform zooming

(ii) use viewing commands to perform panning

(P) plot drawings on media using layout and scale;

(i) plot drawings on media using layout

(ii) plot drawings on media using scale

(Q) use query commands to interrogate database for entity characteristics, distance, area, and status;

(i) use query commands to interrogate database for entity characteristics

(ii) use query commands to interrogate database for entity distance

(iii) use query commands to interrogate database for entity area

(iv) use query commands to interrogate database for entity status

(R) move, stretch, and offset objects;

(i) move objects

(ii) stretch objects

(iii) offset objects

(S) create a radius between objects;

(i) create a radius between objects

(T) trim and extend objects;

(i) trim objects

(ii) extend objects

(U) break and join objects;

(i) break objects

(ii) join objects

(V) change object properties; and

(i) change object properties

(W) create hatching and manipulate properties such as calculating the area of an enclosed shape.

(i) create hatching properties

(ii) create manipulate properties

(4) The student demonstrates the use of CADD tools display and viewpoints. The student is expected to:

(A) create multiple viewpoints in the drawing window;

(i) create multiple viewpoints in the drawing window

(B) select appropriate object snaps for various drawing tasks;

(i) select appropriate object snaps for various drawing tasks

(C) create orthographic drawings;

(i) create orthographic drawings

(D) analyze challenges and identify solutions for design problems;

(i) analyze challenges for design problems

(ii) identify solutions for design problems

(E) investigate the use of space, scale, and environmental features to create three-dimensional form or the illusion of depth and form;

(i) investigate the use of space to create three-dimensional form or the illusion of depth

(ii) investigate the use of space to create three-dimensional form or the illusion of form

(iii) investigate the use of scale to create three-dimensional form or the illusion of depth

(iv) investigate the use of scale to create three-dimensional form or the illusion of form

(v) investigate the use of environmental features to create three-dimensional form or the illusion of depth

(vi) investigate the use of environmental features to create three-dimensional form or the illusion of form

(F) prepare multi-view scaled drawings;

(i) prepare multi-view scaled drawings

(G) select proper drawing scale, views, and layout;

(i) select proper drawing scale

(ii) select proper drawing views

(iii) select proper drawing layout

(H) create drawings containing horizontal and vertical surfaces;

(i) create drawings containing horizontal surfaces

(ii) create drawings containing vertical surfaces

(I) create drawings containing circles and arcs;

(i) create drawings containing circles

(ii) create drawings containing arcs

(J) create removed details and conventional breaks using sectional drawing techniques;

(i) create removed details using sectional drawing techniques

(ii) create conventional breaks using sectional drawing techniques

(K) create assembly drawings;

(i) create assembly drawings

(L) create detail drawings; and

(i) create detail drawings

(M) create technical drawings and title blocks associated with the different CAD drawings.

(i) create technical drawings associated with the different CAD drawings

(ii) create title blocks associated with the different CAD drawings

(5) The student demonstrates the use of software tools to properly create text within a CADD drawing. The student is expected to:

(A) use proper text standards for technical drawings;

(i) use proper text standards for technical drawings

(B) calculate drawing scale and text height using a scale ratio;

(i) calculate drawing scale using a scale ratio

(ii) calculate text height using a scale ratio

(C) apply text styles to enhance readability of drawings;

(i) apply text styles to enhance readability of drawings

(D) demonstrate the use of tools to create multi-line text objects and single-line text;

(i) demonstrate the use of tools to create multi-line text objects

(ii) demonstrate the use of tools to create single-line text

(E) edit existing text; and

(i) edit existing text

(F) create, insert, and modify tables.

(i) create tables

(ii) insert tables

(iii) modify tables

(6) The student demonstrates the use of CADD editing tools within drawings. The student is expected to:

(A) draw chamfers and fillets;

(i) draw chamfers

(ii) draw fillets

(B) use editing tools to modify existing drawings;

(i) use editing tools to modify existing drawings

(C) edit polylines and splines;

(i) edit polylines

(ii) edit splines

(D) move and copy objects;

(i) move objects

(ii) copy objects

(E) create mirror images and align objects; and

(i) create mirror images

(ii) align objects

(F) scale and array objects.

(i) scale objects

(ii) array objects

(7) The student demonstrates the use of grips in drawings. The student is expected to:

(A) apply grips to stretch, move, rotate, scale, mirror, and copy objects;

(i) apply grips to stretch objects

(ii) apply grips to move objects

(iii) apply grips to rotate objects

(iv) apply grips to scale objects

(v) apply grips to mirror objects

(vi) apply grips to copy objects

(B) demonstrate the use of Quick Properties and the Properties palette to access CADD tools; and

(i) demonstrate the use of Quick Properties to access CADD tools

(ii) demonstrate the use of the Properties palette to access CADD tools

(C) create selections by using the Quick Select dialog box.

(i) create selections by using the Quick Select dialog box

(8) The student demonstrates the use of scale and dimension standards and practices. The student is expected to:

(A) apply standard dimensioning rules;

(i) apply standard dimensioning rules

(B) draw scales and dimensions;

(i) draw scales

(ii) draw dimensions

(C) create, edit, and manage dimension styles;

(i) create dimension styles

(ii) edit dimension styles

(iii) manage dimension styles

(D) add linear and angular dimensions to a drawing;

(i) add linear dimensions to a drawing

(ii) add angular dimensions to a drawing

(E) draw datum and chain dimensions;

(i) draw datum dimensions

(ii) draw chain dimensions

(F) dimension circles and arcs;

(i) dimension circles

(ii) dimension arcs

(G) control the appearance of existing dimensions and dimension text; and

(i) control the appearance of existing dimensions

(ii) control the appearance of existing dimension text

(H) change dimension line spacing and alignment.

(i) change dimension line spacing

(ii) change dimension alignment

(9) The student creates and demonstrates standard blocks using tool palettes. The student is expected to:

(A) create and save text information blocks;

(i) create text information blocks

(ii) save text information blocks

(B) insert blocks into a drawing;

(i) insert blocks into a drawing

(C) edit and update a block in a drawing;

(i) edit a block in a drawing

(ii) update a block in a drawing

(D) create blocks as a drawing file;

(i) create blocks as a drawing file

(E) construct and use a symbol library of blocks; and

(i) construct a symbol library of blocks

(ii) use a symbol library of blocks

(F) purge unused items from a drawing.

(i) purge unused items from a drawing

(10) The student prepares surface developments. The student is expected to:

(A) prepare developments of prisms, cylinders, cones, and pyramids;

(i) prepare developments of prisms

(ii) prepare developments of cylinders

(iii) prepare developments of cones

(iv) prepare developments of pyramids

(B) prepare developments of a transition piece; and

(i) prepare developments of a transition piece

(C) prepare drawings involving intersecting pieces.

(i) prepare drawings involving intersecting pieces

(11) The student designs and prepares basic architectural drawings. The student is expected to:

(A) solve design problems to gain new perspectives;

(i) solve design problems to gain new perspectives

(B) apply critical-thinking and problem-solving skills to develop creative solutions for design problems;

(i) apply critical-thinking to develop creative solutions for design problems

(ii) apply problem-solving skills to develop creative solutions for design problems

(C) draw a site plan;

(i) draw a site plan

(D) draw a floor plan;

(i) draw a floor plan

(E) draw interior and exterior elevations;

(i) draw interior elevations

(ii) draw exterior elevations

(F) draw a roof plan;

(i) draw a roof plan

(G) prepare door and window schedules;

(i) prepare door schedules

(ii) prepare window schedules

(H) draw wall sections;

(i) draw wall sections

(I) draw a plot plan; and

(i) draw a plot plan

(J) draw an electrical and reflected ceiling plan.

(i) draw an electrical plan

(ii) draw a reflected ceiling plan

(12) The student designs and prepares a technical drawing. The student is expected to:

(A) draw individual parts;

(i) draw individual parts

(B) draw the closed assembly drawings per the parts; and

(i) draw the closed assembly drawings per the parts

(C) draw and explode the assembly with the parts list.

(i) draw the assembly with the parts list

(ii) explode the assembly with the parts list