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Texas Education Agency

Course: *Intermediate Computer Aided Design and Drafting*
PEIMS Code: *N1303770*
Abbreviation: *INTRCADD*
Grade Level(s): 10-12
Number of Credits: 1.0

Course description:

Intermediate Computer-Aided Design and Drafting (CADD), focuses on the fundamentals of computer-aided drafting using various drafting programs. Emphasis is placed on drawing set up; creating and modifying geometry; storing and retrieving predefined shapes; placing, rotating, and scaling objects; adding text and dimensions; using layers and coordinating systems; and using input and output devices.

Essential knowledge and skills:

(a) General requirements. This course is recommended for students in Grades 10-12. Prerequisite: Architectural Design and Introduction to Computer Aided Drafting and Design (CADD). Students shall be awarded one credit for successful completion of this course.

(b) Introduction.

   (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.

   (2) The Manufacturing Career Cluster focuses on planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

   (3) In Intermediate CADD, students develop practices and techniques used in computer-aided drafting, emphasizing the development and use of prototype drawings, construction of pictorial drawings, construction of three-dimensional drawings, interfacing two-dimensional and three-dimensional environments, and extracting data. Basic rendering techniques will also be developed. Emphasis is placed on drawing set-up; creating and modifying geometry; storing and retrieving predefined

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shapes; placing, rotating, and scaling objects; adding text and dimensions; using layers and coordinating systems; as well as using input and output devices.

    (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.

(c)   Knowledge and skills.

    (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 the manufacturing industry;

        (B)   explain employers' work expectations;

        (C)   demonstrate knowledge of the concepts and skills related to health and safety in the workplace as specified by appropriate governmental regulations;

        (D)   evaluate and justify decisions based on ethical reasoning;

        (E)   evaluate alternative responses to workplace situations based on personal, professional, ethical, legal responsibilities and employer policies;

        (F)   identify and explain personal and long-term consequences of unethical or illegal behaviors in the workplace;

        (G)   interpret and explain written organizational policies and procedures; and

        (H)   demonstrate personal responsibility, ethics and integrity, including respect for intellectual property, when accessing information and creating design projects.

    (2)   The student demonstrates an understanding of computer-aided drafting and design (CADD) terminology, tools, and symbols. The student is expected to:

        (A)   define the Cartesian Coordinate Systems;

        (B)   describe the CADD menu structure;

        (C)   differentiate between type-in commands, icons, and pull down menus;

        (D)   manipulate the standard draw commands;

        (E)   demonstrate modifying commands;

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(F)   explain the various modes of viewing drawings; and

(G)   define dimension styles.

(3)   The student produces hand sketches to organize ideas and communicate design ideas. The student is expected to:

   (A)   demonstrate the use of graphic descriptions;

   (B)   develop skill in sketching and mark making to plan, execute and construct two-dimensional images and three-dimensional models;

   (C)   demonstrate methods of projection; and

   (D)   demonstrate proper drafting techniques to convert sketches into electronic drawing utilizing CADD.

(4)   The student demonstrates an understanding of commands in a CADD system. The student is expected to:

   (A)   operate CADD software;

   (B)   demonstrate draw commands;

   (C)   modify drawn objects in CADD software;

   (D)   create 2D and 3D objects;

   (E)   convert 2D drawings to 3D drawings:

   (F)   convert 3D drawings to 2D drawings;

   (G)   prepare text blocks in CADD software;

   (H)   manipulate an external reference or file;

   (I)   import files of different formats into CADD;

   (J)   demonstrate the plot command in print or plot drawings; and

   (K)   import and export data utilizing attributes.

(5)   The student preforms computed aided drafting functions. The student is expected to:

   (A)   create text styles, text justification, and multi-line text;

   (B)   create and use multi-leaders;

   (C)   edit dimensions;

   (D)   work with dimension styles;

   (E)   crosshatch objects;

   (F)   isolate and hide objects;

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(G)   use selection set methods;

(H)   use rectangular and polar arrays;

(I)   use rotation reference angles;

(J)   use elements of creativity and organizational principles to create visually coherent viewports and layouts;

(K)   create and manage layers;

(L)   use page setup for plotting;

(M)   create, insert, and edit reusable content such as symbols and blocks;

(N)   use specific line types utilizing the Standard Alphabet of Lines;

(O)   create fills and gradients; and

(P)   edit hatch patterns and fills.

(6)   The student creates drawings using the CADD software. The student is expected to:

(A)   translate hand sketches into CADD software;

(B)   create projected mechanical drawings;

(C)   create drawings with external references;

(D)   complete a 3D parametric model;

(E)   organize a complex assembly;

(F)   compare various methods of drawing solids;

(G)   make use of multiple drawings to construct a composite drawing;

(H)   justify correct drawing methods;

(I)   draw lines, arcs, circles, etc. to represent plans and/or mechanical assemblies;

(J)   create text styles, text justification and multi-line text;

(K)   create and use multi-leaders;

(L)   edit dimensions;

(M)   work with dimension styles;

(N)   apply external references;

(O)   isolate and hide objects;

(P)   use selection set methods;

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  (Q) use elements of creativity and organizational principles to create visually coherent viewports and layouts;

  (R) create and manage layers;

  (S) use page setup for plotting;

  (T) prepare multi view drawings;

  (U) prepare sectional views; and

  (V) prepare auxiliary views.

(7) The student creates electrical drawings. The student is expected to:

  (A) prepare schematic drawings;

  (B) prepare printed circuit board assembly drawing packages;

  (C) prepare connection drawings;

  (D) prepare interconnection drawings;

  (E) prepare wiring drawings;

  (F) prepare cable drawings and/ or harness drawings;

  (G) prepare component drawings; and

  (H) prepare logic diagrams.

(8) The student creates mechanical drawings. The student is expected to:

  (A) prepare fastener drawings;

  (B) prepare cam drawings;

  (C) prepare gear drawings;

  (D) prepare assembly drawings;

  (E) prepare detail drawings;

  (F) prepare surface developments;

  (G) prepare technical drawings;

  (H) prepare welding drawings;

  (I) prepare bearing drawings;

  (J) prepare spring drawings;

  (K) prepare casting drawings;

  (L) prepare forging drawings;

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(M)   prepare tool drawings;

(N)   prepare molding diagrams;

(O)   prepare stamping drawings;

(P)   prepare numerical-control drawings;

(Q)   modify drawings to include material specifications and parts list; and

(R)   identify geometric tolerances and dimensioning of specific machined surfaces.

(9)   The student prepares computer aided drawings (CAD) project designs. The student is expected to:

(A)   develop a floor plan depicting all elements of the building;

(B)   develop a site plan that depicts all elements of the site;

(C)   draw exterior and interior elevations;

(D)   draw a roof plan;

(E)   prepare door and window schedules;

(F)   draw a wall section;

(G)   draw an overall site plan;

(H)   draw a building plot plan;

(I)   review and revise plans throughout the design process to refine and achieve design objective;

(J)   demonstrate flexibility and adaptability throughout the design process; and

(K)   define a basic project materials list.

Description of specific student needs this course is designed to meet:

This course provides high school students with the opportunity to learn and apply specific in-depth technical skills related to high-wage, high-demand occupations in architecture and manufacturing. This course exceeds the computer-aided drafting expectations of Texas Essential Knowledge and Skills (TEKS), providing rigorous and focused instruction.

This course along with other courses in the series of courses will assist student to:

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- Enter the job market with a work-ready skill upon completion of high school.
- Receive corporate mentorship and intern/externship opportunities.

Major resources and materials:

Shumaker, T.M., Madsen, D.A., Laurich, J.A, & Malitzke, J.C. (2015) AutoCAD & Its Applications-Advanced 2015. Tinley Park, IL: Goodheart-Willcox

Autodesk Building Design Suite 2017 [computer software]. (2016). Retrieved from www.autodesk.com

Solidworks Premium 2017 [computer software]. (2016).
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Recommended course activities:

Visualize and develop isometric drawings.
Convert 2D) geometry of an object into 3D solid geometry.
Manipulate the advanced commands required for efficient 3D generation.
Create rendered images with multiple scenes plus, export and import raster files.
Generate complex 3D parts and assemblies using external references

Suggested methods for evaluating student outcomes:

Performance on assigned projects and teacher developed assessments will be used to determine the student's success. Students will be evaluated on skill competency, written tests, daily grades and group/individual projects using rubrics.

Teacher qualifications:

- Secondary Industrial Arts (Grades 6-12).
- Secondary Industrial Technology (Grades 6-12).
- Technology Education: Grades 6-12.
- Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.

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- Vocational Trades and Industry. This assignment requires appropriate work approval.

Additional information: