Standards/Measurement Criteria

Drafting and Design Technologies

ELECTRONIC DRAFTING - OPTION B

CIP No. 15.1300.3

***This indicates the "technical skill standards" for this program that will be assessed on the end-of-program Drafting and Design Technologies standards assessment.**

1.0 EXPLORE CAREER PATHWAYS IN DRAFTING AND DESIGN TECHNOLOGY

1.1 Survey the fields of mechanical, civil, architectural and electrical/electronic drafting
1.2 Relate interests, skills and personal orientation to career choices
1.3 Use technology to research career path information
1.4 Survey salary ranges associated with different positions in design and drafting technology

2.0 DEMONSTRATE JOB SEARCH SKILLS NEEDED TO OBTAIN A CAREER IN DRAFTING AND DESIGN TECHNOLOGIES

2.1 Explain the steps in a job search
2.2 Identify employment opportunities in drafting and design technologies utilizing on-line and off-line resources
2.3 Critique a job application

3.0 DEMONSTRATE APPROPRIATE WORK HABITS FOR SUCCESSFUL EMPLOYMENT IN THE FIELD OF DRAFTING AND DESIGN

3.1 Use drafting and design technology vocabulary in context
3.2 Apply basic oral and written communication skills
3.3 Contribute to a team effort
3.4 Practice leadership skills in achieving a group goal
3.5 Plan, organize and implement drafting and design activities

4.0 PARTICIPATE IN LEADERSHIP ACTIVITIES SUCH AS THOSE SUPPORTED BY CAREER AND TECHNICAL STUDENT ORGANIZATION SkillsUSA

4.1 Discuss the roles and responsibilities that leaders and members bring to an organization
4.2 Discuss characteristics and importance of an effective team member
4.3 Explain characteristics of effective workplace teams
4.4 Describe techniques to involve each member of the team

4.5 Participate in career development events
4.6 Develop and implement a personal and professional growth plan
4.7 Identify proper business etiquette
4.8 Define decision-making techniques and processes
4.9 Practice effective meeting management
4.10 Demonstrate business etiquette
4.11 Practice decision-making processes

5.0 EXPLORE PRINCIPLES OF INDUSTRIES RELYING ON DRAFTING AND DESIGN TECHNOLOGY

5.1 Recognize relationship between trades/professions related to drafting and design to facilitate smooth workflow
5.2 Discuss how quality of work affects profitability in drafting and design
5.3 Explain the role and major functions of drafting and design in different industries
5.4 Analyze current trends in drafting and design
5.5 Identify needs and requirements of internal and external customers in drafting and design

6.0 EXPLORE LEGAL AND ETHICAL ISSUES IN DESIGN/ENGINEERING INDUSTRIES

6.1 Define ethics in the drafting and design environment
6.2 Examine the relationship between ethics and the law as it relates to drafting and design
6.3 Explain ethical workplace behavior and how it applies to organizational policies and culture
6.4 Identify workers' rights regarding the workplace issues including safety, drug testing, harassment, discrimination, privacy, etc.

7.0 PRACTICE SAFE AND PRODUCTIVE WORKING PROCEDURES IN DRAFTING AND DESIGN ENVIRONMENTS

7.1 Identify responsibilities of professionals in drafting and design technology in creating and maintaining a safe work environment
7.2 Explain the importance of the OSHA (Occupational Safety and Health Administration) Standards and HazCom (Hazard Communication Standard)
7.3 Apply safety/environmental policies and procedures
7.4 Identify security issues related to computer hardware, software and data
7.5 Explain issues regarding software copyright, software licensing and software copying
7.6 Practice ergonomically sound working procedures

8.0 APPLY PROBLEM SOLVING AND DECISION MAKING PROCESSES TO DRAFTING AND DESIGN RELATED SITUATIONS

8.1 Apply problem-solving processes
8.2 Describe methods of establishing priorities
8.3 Solve problems individually and as part of a team
8.4 Generate creative ideas using critical thinking skills in solving drafting and design related problems
8.5 Evaluate facts, use logic and reason in decision making

9.0 DEMONSTRATE TECHNOLOGICAL LITERACY FOR DRAFTING AND DESIGN OPERATIONS

9.1 Examine the uses of technology in the drafting and design fields
9.2 Demonstrate basic usage of computers (input, storage, output)
9.3 Access information electronically (i.e. Internet, CD-ROM, memory stick)
9.4 Apply file and disk management techniques
9.5 Import text and graphics from other software programs
9.6 Export text and graphic information in different formats to other software programs

10.0 USE MATHEMATICAL PROCESSES TO SOLVE PROBLEMS IN DRAFTING AND DESIGN TECHNOLOGY

10.1 Identify and use common measurement tools used in drafting and design technology and their functions
10.2 Select appropriate measurement techniques for the specific needs of different drafting and design fields
10.3 Perform mathematical calculations in the context of drafting and design related problems
10.4 Recognize and use metric units of length, weight, volume and/or temperature in mathematical problems
10.5 Recognize and use imperial units of length, weight, volume and/or temperature in mathematical problems
10.6 Use technology in the solution of math-related problems

11.0 INTERPRET SCHEMATICS, BLUEPRINTS AND TECHNICAL DRAWINGS

11.1 Interpret dimensions, symbols, legends, scales and directions/orientations
11.2 Analyze how content and information are communicated in schematics, blueprints, and technical drawings
11.3 Analyze schematics, blueprints and technical drawings for clarity, completeness and accuracy
11.4 Recognize cross referencing on technical drawings

12.0 PRACTICE SKETCHING, DRAWING AND VISUALIZATION SKILLS FOR DRAFTING AND DESIGN

12.1 Identify and analyze composition elements
12.2 Employ common types of drafting media and surfaces in traditional or digital form
12.3 Illustrate the basic elements and principles of drafting and design using traditional or digital media
12.4 Identify basic design methods like Golden Mean, Cheng, or Greek Styles

13.0 DEMONSTRATE BASIC OPERATION OF COMPUTER HARDWARE AND SOFTWARE UTILIZED IN DRAFTING AND DESIGN TECHNOLOGY

13.1 Identify computer hardware associated with drafting and design technology
13.2 Apply basic commands of CAD software
13.3 Store and retrieve data for CAD software
13.4 Demonstrate the operation of hardware items that support data output from CAD application software (e.g., printer, projector, etc.)
13.5 Output 2D plotted drawings

14.0 DEVELOP A PLAN FOR A CAREER IN DRAFTING AND DESIGN

14.1 Investigate the variety of drafting and design career options in design, engineering and manufacturing
14.2 Develop career goals based on interests, aptitudes and research
14.3 Manage personal and career goals
14.4 Describe factors that contribute to job satisfaction and success

15.0 PREPARE FOR EMPLOYMENT IN DRAFTING AND DESIGN

15.1 Develop a résumé
15.2 Develop an electronic/scannable format résumé
15.3 Create a drafting and design portfolio with industry-specific work samples
15.4 Complete job application process, including electronic applications
15.5 Demonstrate interviewing skills, including pre-interview preparation and post-interview follow-up
15.6 Research a drafting and design organization as a potential employee

16.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES IN DRAFTING AND DESIGN

16.1 Use technology appropriate for the job
16.2 Demonstrate positive work behaviors
16.3 Demonstrate safe and healthy work behaviors
16.4 Recognize and adapt to changes in the workplace
16.5 Participate in a variety of work-based experiences, paid or non-paid, in drafting and design

17.0 DEMONSTRATE ORAL COMMUNICATION SKILLS FOR DRAFTING AND DESIGN

17.1 Conduct formal/informal research to collect appropriate topical information and data
17.2 Use questioning techniques to obtain needed information from audience
17.3 Interpret oral and nonverbal communications of audience
17.4 Demonstrate active listening during communications
17.5 Demonstrate appropriate technologies for a formal presentation
17.6 Deliver presentation incorporating both appropriate verbal and nonverbal communication techniques

18.0 DEMONSTRATE WRITTEN COMMUNICATION SKILLS FOR DRAFTING AND DESIGN

18.1 Conduct formal/informal research to collect appropriate topical information and data
18.2 Organize information and develop an outline
18.3 Write business communication documents using appropriate format for the situation
18.4 Using appropriate technology, prepare draft document using established rules for grammar, spelling and sentence construction

19.0 EVALUATE BUSINESS AND FINANCIAL MANAGEMENT PRACTICES NEEDED IN DRAFTING AND DESIGN INDUSTRIES

19.1 Review bidding and billing structures used by drafting and design firms
19.2 Review a budget for a design project
19.3 Develop time and production schedules for a project
19.4 Describe the impact of rework, excessive labor costs, scope creep and lack of teamwork on a project budget

20.0 PARTICIPATE IN LEADERSHIP ACTIVITIES SUCH AS THOSE SUPPORTED BY CAREER AND TECHNICAL STUDENT ORGANIZATION SkillsUSA

20.1 Determine the roles and responsibilities that leaders and members bring to an organization
20.2 Describe how personal characteristics affect leadership ability
20.3 Compare/contrast leadership and management styles
20.4 Evaluate characteristics of effective teams
20.5 Describe how cultural/ethnic differences affect interpersonal interactions/ communications within a group
20.6 Evaluate characteristics of an effective team player
20.7 Practice techniques to involve each member of the team
20.8 Demonstrate team work
20.9 Practice effective meeting management
20.10 Demonstrate business etiquette

20.11 Practice decision-making processes

21.0 APPLY MATHEMATICAL CONCEPTS TO PROBLEMS IN DRAFTING AND DESIGN

21.1 Apply basic mathematical skills to drafting and design operations
21.2 Apply mathematical calculations involving practical geometry and trigonometry
21.3 Calculate and evaluate geometric figures
21.4 Create geometric constructions utilizing technical sketching techniques
21.5 Determine/select appropriate dimensioning systems (e.g., decimal, metric)

*22.0 APPLY MEASUREMENT AND SCALE CONCEPTS IN DRAFTING AND DESIGN

22.1 Identify types of measurement used in design drafting
22.2 Select proper measurement tools
22.3 Perform measurements with hand held instruments
22.4 Determine and apply appropriate scale
22.5 Transcribe illustrations accurately

*23.0 INTERPRET ENGINEERING DOCUMENTS AND CONTROL DOCUMENTS

23.1 Interpret dimensions, symbols, legends, scales, and directions/orientations
23.2 Analyze how content and information are communicated in schematics, blueprints, and technical drawings
23.3 Analyze schematics, blueprints, and technical drawings for clarity, completeness and accuracy
23.4 Recognize cross-referencing on technical drawings
23.5 Identify and describe basic types of drawings by trade
23.6 Locate and interpret information on specific documents
23.7 Check prints for dimensional accuracy, completeness, and note detail
23.8 Compare schematics to dimensional drawings
23.9 Verify drawing elements
23.10 Identify conflicting data

*24.0 CREATE TECHNICAL DRAWINGS

24.1 Identify, select, and use fundamental drafting techniques for drawings
24.2 Demonstrate freehand lettering technique
24.3 Identify "Alphabet of Lines" by name, line type variation, order of usage and application on technical drawings
24.4 Create title blocks
24.5 Format borders
24.6 Apply notes and dimensions
24.7 Plot or print drawings using correct layout
24.8 Organize and maintain drawings and supporting documents

*25.0 UTILIZE BASIC COMPUTER CONCEPTS, OPERATIONS AND INFORMATION TECHNOLOGY APPLICATIONS

25.1 Use computer hardware and input/output devices for design drafting problems
25.2 Apply basic commands of operating system software
25.3 Apply file and disk management techniques
25.4 Import and export data files using different formats (dxf, dxb, Tiff, gif, pcx, eps, spd, or other formats as required)
25.5 Prepare files for electronic transfer
25.6 Access and use the Internet for file transfer
25.7 Access and use a computer network for file management and transfer

*26.0 USE A CADD/VDCM (Virtual Design and Construction Modeling) SYSTEMS AND PROCEDURES

26.1 Explore and determine applicability of CADD/VDCM systems to the project
26.2 Analyze drawings using CADD/VDCM software functions/commands
26.3 Use CADD/VDCM software commands to set up drawing scale, format, dimensioning, etc.
26.4 Apply layers/visible items, colors, line types, editing commands, and grouping techniques
26.5 Control entity properties
26.6 Incorporate standard parts, symbol libraries, and/or templates
26.7 Control viewing commands
26.8 Create and manipulate views by modifying coordinate system settings
26.9 Minimize a drawing file for storage and transmission

*27.b DETAIL PROJECTION VIEWS/COMPONENTS

27.1b Determine the appropriate views for projection (i.e., plan, top, front, etc.)
27.2b Identify, create and place views for orthographic projections
27.3b Identify, create and place auxiliary views to determine true size, shape, and location of non-orthogonal features
27.4b Identify, create and place appropriate section views
27.5b Construct full, half and offset section of an object
27.6b Utilize various material hatch patterns in section views

*28.b UTILIZE ELECTRICAL/ELECTRONIC DRAFTING/DESIGN CONCEPTS AND PROBLEMS

28.1b Use electrical/electronic terminology in context
28.2b Identify and apply electrical/electronic symbols
28.3b Solve problems using Ohm’s law
28.4b Use industry-standards, codes, and regulations application software for electrical/electronic drafting to solve a problem
28.5b Evaluate accuracy of electrical/electronics drawings

*29.b DEMONSTRATE DRAFTING AND DESIGN CONCEPTS AS RELATED TO PRINTED CIRCUIT BOARD (PCB) DESIGN

29.1b Draft a logic diagram
29.2b Identify symbols in a schematic
29.3b Diagram schematics to and from specifications
29.4b Draw a harness layout
29.5b Prepare wiring diagrams
29.6b Determine minimum board size
29.7b Prepare single-sided PCB layout drawing
29.8b Prepare double-sided to multi-layered PCB layout drawings
29.9b Prepare an assembly drawing
29.10b Produce circuit board artwork

*30.b DEMONSTRATE DRAFTING/DESIGN CONCEPTS AS RELATED TO INTEGRATED CIRCUIT (IC) DESIGN

30.1b Identify analog and digital gate and transistor device symbols
30.2b Sketch analog transistor symbols (capacitor, resistor)
30.3b Sketch digital symbols at gate and transistor levels
30.4b Draft common IC layout structures (resistors, capacitors, digital gates, etc)
30.5b Prepare sketches of pin configurations and gate locations
30.6b Explain basic logic operations
30.7b Draft a logic diagram
30.8b Diagram schematics