Auburn School District Framework: Engineering Design and Architecture 1 and 2

Course: CAD/CADD Drafting and Design Technology

Total Framework Hours: 180 Hours

CIP Code: 151302

Type: Exploratory

Career Cluster: Science, Technology, Engineering and Mathematics

Date Last Modified: Sunday, June 12, 2016

Resources and Standard used in Framework Development:

Standards used for this framework are from the OSPI Model Framework for 151302 CAD/CADD Drafting andDesign Technology

Unit 1 SKETCHING AND APPLICATIONS

Hours: 16

Performance Assessment(s):

Apply and demonstrate freehand sketching skills.
Create pictorial drawings and models.

SKETCHING AND APPLICATIONS
1.Utilize the creative process to develop a plan to produce and evaluate a product.
2.Apply mathematical thinking and problem-solving to perform tasks.
3.Synthesize information from a variety of sources to plan and present effective professional communications using tools and technology.
4.Demonstrate understanding of terms and principles used in the architectural and engineering profession.
5.Interpret and apply conventional General Drafting Standards to architectural and engineering drafting situations.

Leadership Alignment:

Think Creatively
1.A.1Use a wide range of idea creation techniques (such as brainstorming)
Technicial Sketching and application
Draw 3 views of a CO2 Car or like project

Reason Effectively
2.A.1Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
Design CO2 Car or like project within measurement requirements

Standards and Competencies

Standard: Fundamental Computer Skills
- Demonstrate proper care of equipment
- Start and shut down work station
- Start and exit a software program as required.
- Format and save drawings to storage devices

Standard: Drafting Technical Skills
- Use basic measurement systems
- Use drafting equipment, measuring scales, drafting instruments and reproduction equipment.
- Prepare title blocks and other drafting formats.
- Use various freehand and other lettering techniques
- Use technical skills to develop a working set of drawings.
- Use appropriate standards in the design process.
- Create freehand technical sketches

Aligned to Washington State Standards

Arts

1.2 Develops arts skills and techniques.

- Identifies audience and purpose.
- Analyzes the structure, context and/or aesthetics of the work.

4.5. Understands how arts knowledge and skills are used in the world of work including careers in the arts.

Communication - Speaking and Listening

Health and Fitness

Language

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

2 - Reason abstractly and quantitatively.

6 - Attend to precision.

Reading

CC: Reading Informational Text

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- ☐ Think Creatively
- ☐ Work Creatively with Others
- ☐ Implement Innovations

Creative Thinking and Problem Solving
- ☑ Reason Effectively
- ☑ Use Systems Thinking
- ☐ Make Judgements and Decisions
- ☑ Solve Problems

Communication and Collaboration
- ☑ Communicate Clearly
- ☐ Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- ☑ Access and Evaluate Information
- ☑ Use and Manage Information

Media Literacy
- ☐ Analyze Media
- ☐ Create Media Products

Information, Communications, and Technology (ICT Literacy)
- ☐ Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible

Initiative and Self-Direction
- ☑ Mange Goals and Time
- ☐ Work Independently
- ☐ Be Self-Directed Learners

Social and Cross-Cultural
- ☑ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☐ Produce Results

Leadership and Responsibility
- ☐ Guide and Lead Others
- ☐ Be Responsible to Others

Unit 2 MECHANICAL ENGINEERING DRAWING AND CADD APPLICATION Hours: 36

Performance Assessment(s):

Apply mathematical concepts to problems in engineering and design.
Apply measurement and scale concepts in engineering and design.
Interpret engineering documents and control documents.
Create technical drawings using basic drafting procedures.
Students explain the difference between one-point, two-point, and three-point perspectives.
Students demonstrate and explain to another student how to measure objects using a scale or dial caliper.
Students make journal entries reflecting on their learning and experiences.

Leadership Alignment:

Design an object 1.A.3Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts
7.A.1 Adapt to varied roles, students take on the role of consulting.
11.A.2 Leverage strengths of others Students conference with their peers to develop a design per the client's request.

Standards and Competencies

Standard: Fundamental Computer Skills
- Demonstrate proper care of equipment
- Operate and adjust input devices
- Correct handling and operation of storage media
- Start and exit a software program as required.

Standard: Drafting Technical Skills
- Use basic measurement systems
- Demonstrate the use of the alphabet of lines including styles and weights.
- Use technical skills to develop a working set of drawings.
- Create freehand technical sketches
- Read technical drawings and documents to plan a project.

Standard: Math and Measurements for Drafting
- Demonstrate basic math principles
- Perform addition, subtraction, division and multiplication of whole numbers, fractions, decimals, metric and percentages.
- Measure parts using an engineer scale (1/50th scale), fractional scale, metric scale, vernier caliper, micrometer.
- Develop drawings utilizing measurements.
- Solve problems using algebra

Standard: Basic CAD Skills - Create
- Create new drawing
- Perform drawing set up
- Use and control accuracy enhancement tools for entity positioning methods such as snap and XYZ.
- Plot drawings on media using layout and scale.

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening

Health and Fitness

Language

Mathematics

CC: Number and Quantity (N)

Quantities (N-Q)

2 - Define appropriate quantities for the purpose of descriptive modeling.*

CC: Geometry (G)

1 - Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around

3 - Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*

Reading

CC: Reading Informational Text

2 - Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- ☐ Think Creatively
- ☑ Work Creatively with Others
- ☐ Implement Innovations

Creative Thinking and Problem Solving
- ☑ Reason Effectively
- ☑ Use Systems Thinking
- ☐ Make Judgements and Decisions
- ☑ Solve Problems

Communication and Collaboration
- ☑ Communicate Clearly
- ☐ Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- ☑ Access and Evaluate Information
- ☑ Use and Manage Information

Media Literacy
- ☐ Analyze Media
- ☐ Create Media Products

Information, Communications, and Technology (ICT Literacy)
- ☑ Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible

Initiative and Self-Direction
- ☑ Mange Goals and Time
- ☑ Work Independently
- ☐ Be Self-Directed Learners

Social and Cross-Cultural
- ☐ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☑ Produce Results

Leadership and Responsibility
- ☑ Guide and Lead Others
- ☐ Be Responsible to Others

Unit 3 ARCHITECTURAL DRAWING AND CADD APPLICATIONS Hours: 36

Performance Assessment(s):

Apply mathematical concepts to problems in engineering and design.
Apply measurement and scale concepts in engineering and design.
Interpret engineering documents and control documents.
Create technical drawings using basic drafting procedures.

Standards and Competencies
1.Utilize the creative process to develop a plan to produce and evaluate a product.
2.Apply mathematical thinking and problem-solving to perform tasks.
3.Demonstrate understanding of terms and principles used in the architectural and engineering profession.
4.Interpret and apply conventional General Drafting Standards to architectural and engineering drafting situations.
5.Interpret and apply conventional Computer Aided Drafting Standards to architectural and engineering drafting situations.

Leadership Alignment:

Develop a plan/project within the parameters set by the instructor, present project to the class.
2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
Use and Manage Information
4.B.1 Use information accurately and creatively for the issue or problem at hand

Standards and Competencies

Standard: Architectural Drafting with AutoCad
- Careers in Architecture
- Architectural Design Process
- Starting Auto CAD
- Creating a new drawing

Standard: Multi-view or Orthographic Projections
- Prepare multi-view or orthographic freehand sketches.
- Select proper drawing scale, views and layout.
- Prepare drawings containing horizontal and vertical surfaces.
- Prepare drawings containing circles and/or arcs.

Standard: Math and Measurements for Drafting
- Demonstrate basic math principles
- Solve problems using formulas
- Measure parts using an engineer scale (1/50th scale), fractional scale, metric scale, vernier caliper, micrometer.
- Develop drawings utilizing measurements.

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening

Health and Fitness

Language

CC: College and Career Readiness Anchor Standards for Language

3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

6 - Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career

Mathematics

CC: Number and Quantity (N)

1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and

8 (+) - Add, subtract, and multiply matrices of appropriate dimensions.

Reading

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [ ] Work Creatively with Others
- [ ] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [x] Use Systems Thinking
- [ ] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [ ] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [ ] Analyze Media
- [ ] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [ ] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [ ] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [ ] Mange Goals and Time
- [x] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [ ] Interact Effectively with Others
- [ ] Work Effectively in Diverse Teams

Productivity and Accountability
- [ ] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [ ] Guide and Lead Others
- [ ] Be Responsible to Others

Unit 4 COMPUTER AIDED DESIGN AND DRAFTING CADD — Hours: 38

Performance Assessment(s):

Manage basic computer concepts, operations and applications
Apply and use CADD systems and procedures
Apply and understand detail projection views/components
Explore engineering and architectural design concepts and problems
Demonstrate engineering design concepts as related to basic manufacturing processes

Standards and Competencies
1.Utilize the creative process to develop a plan to produce and evaluate a product.
2.Apply mathematical thinking and problem-solving to perform tasks.
3.Synthesize information from a variety of sources to plan and present effective professional communications using tools and technology.
4.Understand and apply science skills and concepts to develop solutions in the context of preparing for work.
5.Demonstrate understanding of terms and principles used in the architectural and engineering profession.
6.Interpret and apply conventional General Drafting Standards to architectural and engineering drafting situations.
7.Interpret and apply conventional Computer Aided Drafting Standards to architectural and engineering drafting situations.

Leadership Alignment:

Utilize the creative process to develop a plan to produce and evaluate a product.
Apply Technology Effectively
6.A.1Use technology as a tool to research, organize, evaluate and communicate information

Demonstrate understanding of terms and principles used in the architectural and engineering through class presentation.
7.B.2 Deal positively with praise, setbacks and criticism

Standards and Competencies

Standard: Fundamental Computer Skills
- Demonstrate proper care of equipment
- Operate and adjust input devices
- Operate and adjust output devices
- Correct handling and operation of storage media
- Perform basic operating system functions.
- Format and save drawings to storage devices

Standard: Basic CAD Skills - Manipulate
- Control coordinates and display scale
- Control entity properties
- Use viewing commands
- Use display commands
- Use standard parts and/or symbol libraries
- Plot drawings on media using correct layout and scale
- Use layering techniques
- Use grouping techniques
- Minimize file size

Standard: Fundamentals in Design
- Architecture and design
- Elements of design

- Principles of design

Aligned to Washington State Standards

Arts

2.1. Applies a creative process to the arts (dance, music, theatre and visual arts):
- Identifies audience and purpose.

Communication - Speaking and Listening

Health and Fitness

Language

3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

4 - Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.

Mathematics

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.

5 - Use appropriate tools strategically.

6 - Attend to precision.

7 - Look for and make use of structure.

Reading

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [ ] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [ ] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [ ] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [ ] Analyze Media
- [ ] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [ ] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [ ] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [ ] Interact Effectively with Others
- [ ] Work Effectively in Diverse Teams

Productivity and Accountability
- [ ] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [ ] Guide and Lead Others
- [ ] Be Responsible to Others

Unit 5 DESIGN AND PROBLEM SOLVING PROCESS AND APPLICATION Hours: 38

Performance Assessment(s):

Apply and demonstrate the basic steps to design and problem solving through projects.

Standards and Competencies
1.Utilize the creative process to develop a plan to produce and evaluate a product.
2.Apply mathematical thinking and problem-solving to perform tasks.
3.Understand and apply science skills and concepts to develop solutions in the context of preparing for work.
4.Understand and apply appropriate safety policies and procedures.

Leadership Alignment:

Design a TSA project/building to incorporate the challenge list, have evaluate by class teams after presentation.

8.C.1 Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
Reason Effectively
2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use and Manage Information
4.B.1 Use information accurately and creatively for the issue or problem at hand

Standards and Competencies

Standard: Drafting Technical Skills
- Use drawing media and related drafting materials.
- Use basic measurement systems
- Demonstrate the use of the alphabet of lines including styles and weights.
- Use appropriate media to communicate technical information
- Use appropriate standards in the design process.
- Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space.
- Create freehand technical sketches
- Read technical drawings and documents to plan a project.

Standard: Pictorial Drawings
- Apply line of sight
- Identify the use and application of pictorial drawings.
- Sketch pictorial drawings.
- Identify and create axonometric drawings
- Identify and create oblique drawings
- Identify and create perspective drawings

Standard: Dimensioning
- Correctly apply ANS/ASME/DOD/ISO dimensioning standards as applicable.
- Use correct dimension line terminators
- Dimension objects containing linear, angular, and circular standard dimensions.
- Dimension complex shapes
- Dimension features from a center line
- Use appropriate dual dimensioning standards

- Use size and location dimension practices
- Use various dimensioning styles

Standard: Tolerances
- Identify and use tolerance terminology
- Dimension with a consideration for accumulation of tolerance impacts
- Calculate clearance and interference fit tolerance of mating parts using tables.
- Apply tolerance to dimensions using unilateral, bilateral, and limits.

Standard: Basic CAD Skills - Manipulate
- Control coordinates and display scale
- Control entity properties
- Use viewing commands
- Use display commands
- Plot drawings on media using correct layout and scale
- Use layering techniques
- Use grouping techniques

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening

Health and Fitness

Language

Mathematics

CC: Geometry (G)

CC: Mathematical Practices (MP)

1 - Make sense of problems and persevere in solving them.
2 - Reason abstractly and quantitatively.
3 - Construct viable arguments and critique the reasoning of others.
5 - Use appropriate tools strategically.
6 - Attend to precision.
7 - Look for and make use of structure.

Reading

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation
- [x] Think Creatively
- [x] Work Creatively with Others
- [x] Implement Innovations

Creative Thinking and Problem Solving
- [x] Reason Effectively
- [x] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration
- [x] Communicate Clearly
- [x] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy
- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy
- [ ] Analyze Media
- [x] Create Media Products

Information, Communications, and Technology (ICT Literacy)
- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability
- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction
- [x] Mange Goals and Time
- [x] Work Independently
- [x] Be Self-Directed Learners

Social and Cross-Cultural
- [ ] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability
- [x] Manage Projects
- [x] Produce Results

Leadership and Responsibility
- [ ] Guide and Lead Others
- [x] Be Responsible to Others

Unit 6 CAREERS AND LEADERSHIP - 21ST CENTURY SKILLS Hours: 16

Performance Assessment(s):

Develop a plan for a career in the fields of Engineering and Architecture.
Prepare for employment in the fields of Engineering and Architecture.
Participate in leadership activities such as those supported by career and technical student organizations.

Standards and Competencies

1.Synthesize information from a variety of sources to plan and present effective professional communications using tools and technology.
2.Read with comprehension to gain information and/or perform a task in a career setting.
3.Demonstrate professional development skills in a simulated customer service or employment situation.

Leadership Alignment:

Presentation on job opportunities in this field

4.B.1 Use information accurately and creatively for the issue or problem at hand
8.C.4 Reflect critically on past experiences in order to inform future progress

Standards and Competencies

Standard: Fundamentals in Design
- Architecture and design
- Elements of design
- Principles of design

Standard: Environmental Design Factors
- Orientation
- Ergonomic Planning
- Ecology

Aligned to Washington State Standards

Arts

Communication - Speaking and Listening

Health and Fitness

Language

Conventions of Standard English (9-10)

1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Knowledge of Language (9-10)

3 - Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when

Conventions of Standard English (11-12)

1 - Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

Mathematics

Reading

CC: Reading Informational Text

Craft and Structure (9-10)

4 - Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word

Range of Reading and Level of Text Complexity (9-10)

10 - By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By

1 - Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves

Science

Social Studies

Writing

21st Century Skills

LEARNING AND INNOVATION

Creativity and Innovation

- [x] Think Creatively
- [x] Work Creatively with Others
- [x] Implement Innovations

Creative Thinking and Problem Solving

- [x] Reason Effectively
- [x] Use Systems Thinking
- [x] Make Judgements and Decisions
- [x] Solve Problems

Communication and Collaboration

- [x] Communicate Clearly
- [x] Collaborate with Others

INFORMATION, MEDIA AND TECHNOLOGY SKILLS

Information Literacy

- [x] Access and Evaluate Information
- [x] Use and Manage Information

Media Literacy

- [x] Analyze Media
- [x] Create Media Products

Information, Communications, and Technology (ICT Literacy)

- [x] Apply Technology Effectively

LIFE AND CAREER SKILLS

Flexibility and Adaptability

- [x] Adapt to Change
- [x] Be Flexible

Initiative and Self-Direction

- [x] Mange Goals and Time
- [x] Work Independently
- [ ] Be Self-Directed Learners

Social and Cross-Cultural

- [x] Interact Effectively with Others
- [x] Work Effectively in Diverse Teams

Productivity and Accountability

- [x] Manage Projects
- [x] Produce Results

Leadership and Responsibility

- [x] Guide and Lead Others
- [ ] Be Responsible to Others