



Auburn School District

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| Course: Aerospace Manufacturing | Total Framework Hours up to: 540 |
| CIP Code: 469998 <input checked="" type="checkbox"/> Exploratory <input type="checkbox"/> Preparatory | Date Last Modified: November 19, 2015 |
| Career Cluster: Architecture and Construction | Cluster Pathway: Construction |

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Multimedia presentation of Aerospace Career research
- Students will perform a job search and create a resume
- Students will have the opportunity to participate in a mock interview

Leadership Alignment:

- Students will research a career in the aerospace industry and then deliver a multimedia presentation to a group.

Think Creatively

1.A.1 Use a wide range of idea creation techniques (such as brainstorming)

Work Creatively with Others

1.B.3 Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas

Solve Problems

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Communicate Clearly

3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

Standards and Competencies

Unit 1: Introduction to Aerospace Manufacturing Careers

Competencies

Total Learning Hours for Unit: 20

- The student will demonstrate the ability to research and find job opportunities.
- The student will create a resume.
- The student will understand and demonstrate time management.
- The student will understand the need for and use of diversity in the workplace.
- The student will demonstrate basic computer skills.

Aligned Washington State Standards

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| Educational Technology | 1.3.2 Locate and organize information from a variety of sources and media. |
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| | 2.2.1 Practice ethical and respectful behavior. |
| Grades 11-12 English Language Arts | Comprehension and Collaboration (Standards 2, 3) Presentation of Knowledge and Ideas (Standards 4, 5, 6) |
| Social Studies | Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living |

COMPONENTS AND ASSESSMENTS

Performance Assessments:

- Students will conduct a classroom and shop safety inspection
- Students will complete safety tests for hand tools and power tools

Leadership Alignment:

- Students will complete a shop safety inspection
- Students will demonstrate safe behavior and safety awareness in the shop
- Students will create a shop safety poster/publication

Think Creatively

1.A.2 Use a wide range of idea creation techniques (such as brainstorming)

Work Creatively with Others

1.B.3 Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas

Solve Problems

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Communicate Clearly

3.A.1 Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts

Make Judgments and Decisions

2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

Reason Effectively

2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

STANDARDS AND COMPETENCIES

Unit 2 : Safety

Competencies

Total Learning Hours for Unit: 25

- The student will understand how OSHA relates to the work environment.
- The student will demonstrate the use of the MSDS and how to find safety information on it.
- The student will demonstrate knowledge of correct safety practices in the aerospace manufacturing environment.
- The student will know and apply safe practices with hand tools.
- The student will know and apply safe practices with power tools.
- The student will demonstrate understanding and apply proper use of personal protective equipment.

Aligned Washington State Standards

Educational Technology

1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry.
2.1.1 Practice personal safety.

**Grades 11-12
English Language Arts**

Comprehension and Collaboration (Standards 2, 3)
Knowledge of Language (Standard 3)
Research to Build and Present Knowledge (Standards 7, 8, 9)

Health & Fitness

2.3 Acquire skills to live safety and reduce health risks.

3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals).

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Students will complete various measuring activities to demonstrate proper use of standard and metric rulers, tape measures, scales and calipers.
- Students will complete scaled drawings to demonstrate knowledge of reading and converting measurements

Leadership Alignment:

- Students will analyze and double check measurement and math skills of peers
- Students will have the opportunity to participate in a job shadow and apply for an internship

Use Systems Thinking

2.B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex

Solve Problems

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Use and Manage Information

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

STANDARDS AND COMPETENCIES

Unit 3: Manufacturing Math Skills and Precision Measurement

Competencies

Total Learning Hours for Unit: 45

- The student will know and demonstrate basic mathematic skills.
- The student will know and demonstrate decimal and fraction math skills.
- The student will know and demonstrate units of measurement skills.
- The student will know and apply basic tolerances to dimensions.
- The student will read and interpret blueprints and engineering drawings.
- The student will inspect and measure various holes for size and accuracy.
- The student will demonstrate basic measurement techniques
- The student will demonstrate geographic dimensioning and tolerance.
- The student will use Vernier scales – calipers and micrometers – to accurately measure objects.
- The student will measure various objects using 12 inch scales.
- The student will measure various objects using dial and digital calipers.
- The student will demonstrate the correct usage of height gauges.
- The student will demonstrate creating and using sketching and dimensional sketching.

Aligned Washington State Standards

Math

N-CN-Perform arithmetic operations with complex numbers (Standards 1, 2, 3)

G-GMD-Visualize relationships between two-dimensional and three-dimensional objects (Standard 4)

Grades 11-12

English Language Arts

Key Ideas and Details (Standards 2, 3)

Integration of Knowledge and Ideas (Standards 7, 9)

Science

HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Turbine engine theory and major component test incorporating sketching and identifying the components of turbine jet and turbofan engines, and explaining what happens in each stage of the engine.
- Multimedia presentation demonstrating knowledge of lift, drag, thrust, weight and fluid flow

Leadership Alignment:

- Students will peer review drawings for accuracy
- Students will research and then deliver a multimedia presentation to a group demonstrating fluid flow around vehicle bodies

Solve Problems

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

Adapt to Change

7.A.1 Adapt to varied roles, jobs responsibilities, schedules and contexts

Be Self-Directed Learners

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

STANDARDS AND COMPETENCIES

Unit 4: Basics of Flight and Aerodynamics

Competencies

Total Learning Hours for Unit: 15

- The student will know and demonstrate the concepts of lift, drag, thrust, weight
- The student will know and demonstrate the concepts of fluid flow around vehicle bodies.
- The student will identify the major components of the turbine engine and explain its purpose.
- The student will explain the operational theory of turbine engine technology.

Aligned Washington State Standards

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| <p>Math</p> | <p>N-RN-Use properties of rational and irrational numbers (Standard 3) N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) N-CN-Perform arithmetic operations with complex numbers (Standards 1, 2, 3) N-VM-Represent and model with vector quantities. (Standards 1, 2, 3) A-SSE-Interpret the structure of expressions (Standards 1, 2) A-SSE-Write expressions in equivalent forms to solve problems (Standards 3, 4) A-APR-Rewrite rational expressions (Standards 6, 7) A-REI-Understand solving equations as a process of reasoning and explain the reasoning (Standards 1, 2)</p> |
| <p>Science</p> | <p>HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Students will use engineering processes to formulate an airplane concept, design it, and manufacture a prototype for testing and to demonstrate manufacturing techniques
- Students will list common sources of FOD, and write out a practical method of inventory control of tools in an aerospace manufacturing environment.

Leadership Alignment:

- Team project manager and leadership roles for design & manufacturing project
- Demonstrate FOD (foreign object debris) prevention & inventory control to group
- Demonstrate shop and tool safety practices
- Students will have the opportunity to invite a guest speaker into the class

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

2.C.1 Interpret information and draw conclusions based on the best analysis

Solve Problems

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Collaborate with Others

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Use and Manage Information

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

Be Self-Directed Learners

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

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products

STANDARDS AND COMPETENCIES

Unit 5: Aircraft Manufacturing Processes

Competencies

Total Learning Hours for Unit: 55

- Student will understand and demonstrate 5 stages of aircraft manufacturing processes: conception, design, manufacture, testing, quality, and inspections systems.
- Student will demonstrate engineering processes and product development
- Student will read, interpret and create production prints and engineering drawings.
- Students will understand and demonstrate basic logistics and supply chain.
- Students will explain and demonstrate inventory control and its importance to the manufacturing process.
- Students will understand importance of foreign object debris/damage (FOD) prevention
- Students will demonstrate understanding basics of inspection & quality control.
- Students will demonstrate understanding of root cause analysis.
- Students will demonstrate usage of precision measuring instruments.

Aligned Washington State Standards

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| Educational Technology | <p>1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities.</p> <p>1.2.1 Communicate and collaborate to learn with others.</p> <p>1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry</p> <p>2.4.1 Formulate and synthesize new knowledge.</p> |
| <p>Grades 11-12</p> <p>English Language Arts</p> | <p>Comprehension and Collaboration (Standards 1, 2)</p> <p>Knowledge of Language (Standard 3)</p> <p>Vocabulary Acquisition and Use (Standards 4, 5, 6)</p> |
| Science | <p>HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> <p>HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> |
| Social Studies | <p>Economics 1.1 Understand that the condition of scarcity requires people to choose among alternatives and bear the consequences of that choice.</p> <p>Economics 1.2 Understand that the availability and use of resources influences the production of goods and services to the economy.</p> <p>Economics 2.4 Understand that investment in people, tools, and technology affect employment levels and standard of living.</p> |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Components of airline operations will be labeled to the appropriate sections on drawings of an airplane. The components relationships will be described with reference to the various sections of the airplane
- Presentation of airport emissions and their environmental impact

Leadership Alignment:

- As a group select a specific airport, research the airport's emissions and airline operations, prepare a multi-media presentation and then present findings to the class
- Students will have the opportunity to interview someone working at an airport or airplane manufacturing facility

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

2.C.4 Interpret information and draw conclusions based on the best analysis

Collaborate with Others

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Use and Manage Information

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

Be Self-Directed Learners

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

STANDARDS AND COMPETENCIES

Unit 6: Airline Operations Overview

Competencies

Total Learning Hours for Unit: 15

- Student will understand and demonstrate the basic components of airline operations: flight support, crew support, passenger sales & support, ground support, maintenance, aircraft ownership, etc.
- Student will demonstrate how components of airline operations relates to and interacts with airplane design and manufacture.
- Student will relate airport emissions to their effect on the local environment

Aligned Washington State Standards

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| Educational Technology | 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry 2.4.1 Formulate and synthesize new knowledge. |
| Grades 11-12 English Language Arts | Comprehension and Collaboration (Standards 1, 2, 3) Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 4, 5, 6) |
| Science | HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Apply aircraft manufacturing testing principles to the quality assurances project
- Summative testing of LEAN design, six sigma, 5S, ISO and FAA roles

Leadership Alignment:

- Peer review of testing principles in a project demonstrating quality assurance and guide tools while selecting the correct fasteners

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

2.C.2 Interpret information and draw conclusions based on the best analysis

Solve Problems

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Collaborate with Others

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Use and Manage Information

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

Be Self-Directed Learners

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

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products

STANDARDS AND COMPETENCIES

Unit 7: Airplane Manufacturing Principles and Quality Control

Competencies

Total Learning Hours for Unit: 35

- Students will understand the concepts of LEAN design, six sigma
- Students will understand 5S principles.
- Students will demonstrate understanding of aircraft manufacture testing.
- Students will demonstrate understanding of ISO Standards and the role they play in manufacturing.
- Students will analyze the role of the FAA with respect to airplane manufacture, maintenance, and quality control

Aligned Washington State Standards

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| Educational Technology | 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry 1.3.2 Locate and organize information from a variety of sources and media. |
| Grades 11-12 English Language Arts | Comprehension and Collaboration (Standards 1, 2) Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 5, 6) |

Science

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Simple stress analysis of stringer
- Stress, strain & fatigue labeling by components and its affects

Leadership Alignment:

- Research and explain the physics of stress, strain & fatigue an airplane endures under varying conditions to peers

Use Systems Thinking

2.B.1 Analyze how parts of a whole interact with each other to produce overall outcomes in complex

Solve Problems

2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Use and Manage Information

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

STANDARDS AND COMPETENCIES

Unit 8: Static & Dynamic Loads (Stress)

Competencies

Total Learning Hours for Unit: 22

- Students will understand and apply the physics behind stress and strain.
- Students will identify and explain the various forms of stress, strain, and fatigue experienced by airplane components.
- Students will understand and explain how fatigue and stress affect the materials used in airplane manufacture.

Aligned Washington State Standards

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| Educational Technology | 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry 1.3.2 Locate and organize information from a variety of sources and media 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.4.1 Formulate and synthesize new knowledge. |
| Math | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) N-VM-Represent and model with vector quantities. (Standards 1, 2, 3) N-VM-Perform operations on vectors. (Standards 4, 5) A-SSE-Write expressions in equivalent forms to solve problems (Standards 3, 4) |
| Grades 11-12 English Language Arts | Comprehension and Collaboration (Standards 1, 2) Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 4, 5, 6) |
| Science | HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Students will complete various simulations demonstrating their ability to match performance characteristics and corrosion inhibitors to materials and identify major sources of stress in airplanes.

Leadership Alignment:

- Peer review of material performance characteristics and strength requirements for airplane components

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

2.C.4 Interpret information and draw conclusions based on the best analysis

Use and Manage Information

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

Be Self-Directed Learners

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

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products

STANDARDS AND COMPETENCIES

Unit 9: Materials Selection & Use in Aerospace

Competencies

Total Learning Hours for Unit: 20

- Students will understand the characteristics of the key materials used in aerospace manufacture, including aluminum, steel, composites, ceramics, etc.
- Students will document the stress and fatigue characteristics of the key materials used in aerospace manufacture, including aluminum, steel, composites, ceramics, etc.
- Students will compare strength requirements and fatigue characteristics of the major components of an airplane and make recommendations for material usage.
- Students will document the forms of corrosion that occurs to common aerospace materials and what kind of coatings and corrosion prevention can be done to prevent it.

Aligned Washington State Standards

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| Educational Technology | 1.1.1 Generate ideas and create original works for personal and group expression using a variety of digital tools. 1.1.2 Use models and simulations to explore systems, identify trends and forecast possibilities. 1.2.1 Communicate and collaborate to learn with others. 1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 2.4.1 Formulate and synthesize new knowledge. |
| Math | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) N-VM-Represent and model with vector quantities. (Standards 1, 2, 3) N-VM-Perform operations on vectors. (Standards 4, 5) A-SSE-Write expressions in equivalent forms to solve problems (Standards 3, 4) |
| Grades 11-12 | Comprehension and Collaboration (Standards 2, 3) |

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| English Language Arts | Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 4, 5, 6) |
| Science | HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Students will demonstrate performance competencies for hand tools, pneumatic hand tools, drilling & countersinking techniques, power island equipment
- Students will design and implement a tool inventory & control plan

Leadership Alignment:

- With a partner, demonstrate safe use of powered and non-powered hand tools while drilling and & countersinking in various materials.

Think Creatively

- 1.A.1 Use a wide range of idea creation techniques (such as brainstorming)
- 1.A.2 Create new and worthwhile ideas (both incremental and radical concepts)

Work Creatively with Others

- 1.B.1 Develop, implement and communicate new ideas to others effectively
- 1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

- 2.C.1 Effectively analyze and evaluate evidence, arguments, claims and beliefs

Reason Effectively

- 2.A.1 Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Solve Problems

- 2.D.1 Solve different kinds of non-familiar problems in both conventional and innovative ways

STANDARDS AND COMPETENCIES

Unit 10: Manufacturing Tools

Competencies

Total Learning Hours for Unit: 50

- Students will demonstrate safe usage of manufacturing hand tools (non-powered).
- Students will demonstrate safe usage of manufacturing pneumatic hand tools (powered).
- Students will demonstrate techniques for drilling & countersinking in various materials.
- Students will develop and demonstrate methods for tool inventory & control.
- Students will demonstrate safe usage of power island manufacturing equipment (heavy stationary equipment).

Aligned Washington State Standards

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| Educational Technology | 2.1.1 Practice personal safety. 2.2.1 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.2.2 Use a variety of hardware to support learning. 2.4.1 Formulate and synthesize new knowledge. |
| Math | N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3) |
| Grades 11-12 | Knowledge of Language (Standard 3) |
| English Language Arts | Vocabulary Acquisition and Use (Standards 4, 5, 6) |

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| Health & Fitness | 2.3 Acquire skills to live safety and reduce health risks. 3.1 Understand how environmental factors affect one's health. (Air, water, noise, chemicals). 3.3 Use social skills to promote health and safety in a variety of situations. |
| Science | HS-PS2-1 Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. HS-PS2-2 Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Fastener labeling quiz (includes various bolts, washers, nuts, Hi-Lok fasteners, etc.)
- Demonstration of riveting and fastener competency

Leadership Activities

- Collaborating with a group of four, create a multimedia presentation identifying and describing various types of aircraft rivets, Hi-Lok fasteners, bolts, washers, and nuts used in aerospace manufacturing that will be shared with another group

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Make Judgments and Decisions

2.C.3 Interpret information and draw conclusions based on the best analysis

Solve Problems

2.D.2 Identify and ask significant questions that clarify various points of view and lead to better solutions

Collaborate with Others

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Use and Manage Information

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

Be Self-Directed Learners

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

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products

STANDARDS AND COMPETENCIES

Unit 11: Fasteners and Introductory Projects

Competencies

Total Learning Hours for Unit: 20

- Students will understand and demonstrate types of aircraft fasteners.
- Students will identify, and describe how various types of aircraft rivets are used in aerospace manufacturing.
- Students will identify, and describe how various types of Hi-Lok fasteners are used in aerospace manufacturing.
- Students will identify, and describe how various types of bolts, washers and nuts are used in aerospace manufacturing.

Aligned Washington State Standards

Educational Technology

1.2.1 Communicate and collaborate to learn with others.
1.3.1 Identify and define authentic problems and significant questions for investigation and plan strategies to guide inquiry
2.4.1 Formulate and synthesize new knowledge.

Math

N-Q-Reason quantitatively and use units to solve problems (Standards 1, 2, 3)
A-SSE-Write expressions in equivalent forms to solve problems (Standards 3, 4)

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| <p>Grades 11-12 English Language Arts</p> | <p>Comprehension and Collaboration (Standards 1, 2, 3) Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 4, 5, 6)</p> |
| <p>Science</p> | <p>HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.</p> |

COMPONENTS AND COMPETENCIES

Performance Assessments:

- Competency demonstrations for gas, MIG & TIG welding
- Competency demonstrations for layout, drilling and countersinking, and connecting steel sheets
- Competency demonstrations for layout, drilling and countersinking, and connecting and riveting aluminum sheets
- Students will maintain a journal detailing techniques, skills and knowledge learned in the course of completing all above projects.

Embedded leadership Activities

- Individually, students will work with a set of drawing to layout drill, countersink, and connect aluminum sheets using various aircraft fasteners
- In teams students will design a working set of drawings then utilize advanced manufacturing techniques to cut the templates, while examining the ethical and legal issues related to creating a unique piece of work
- Students will have the opportunity to attend and present at an advisory committee meeting
- Students will participate in their school elective fair to encourage exploration of the Aerospace program

Work Creatively with Others

1.B.4 View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Implement Innovations

1.C.1 Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur

Make Judgments and Decisions

2.C.4 Interpret information and draw conclusions based on the best analysis

Collaborate with Others

3.B.2 Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal

Use and Manage Information

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

Be self-directed learners

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.

Adapt to change

7.A.1 Adapt to varied roles, jobs, responsibilities, schedules and contexts.

Produce Results

10.B.1 Demonstrate additional attributes associated with producing high quality products

STANDARDS AND COMPETENCIES

Unit 12: Advanced Manufacturing Projects

Competencies

Total Learning Hours for Unit: 218

- Students will use working set of drawings to layout, drill, countersink, and connect steel sheets and frame components using various welding techniques, including gas, MIG, and TIG in 4 different projects of increasing levels of difficulty.
- Students will use working set of drawings to layout aluminum, drill, countersink, and connect aluminum sheets using various aircraft fasteners, including rivets, hi-Loks, and various bolts, nuts and washers in 4 different projects of increasing levels of difficulty.
- Students will design working set of drawings, use advance manufacturing techniques to cut templates, and use the templates to layout and create 4 composite projects of increasing levels of difficulty.

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| Educational Technology | <p>1.2.1 Communicate and collaborate to learn with others. 1.2.2 Develop cultural understanding and global awareness by engaging with learners of many cultures. 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results. 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions. 2.1.1 Practice personal safety. 2.1.2 Practice ethical and respectful behavior. 2.2.1 Develop skills to use technology effectively. 2.4.1 Formulate and synthesize new knowledge.</p> |
| Health and Fitness | 3.3 Use social skills to promote health and safety in a variety of situations. |
| Grades 11-12 English Language Arts | Comprehension and Collaboration (Standards 2, 3) Knowledge of Language (Standard 3) Vocabulary Acquisition and Use (Standards 4, 5, 6) Integration of Knowledge and Ideas (Standards 7, 8 9) |
| Science | HS-PS3-1 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy. HS-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |

21st Century Skills

Check those that students will demonstrate in this course:

LEARNING & INNOVATION**Creativity and Innovation**

- Think Creatively
- Work Creatively with Others
- Implement Innovations

Critical Thinking and Problem Solving

- Reason Effectively
- Use Systems Thinking
- Make Judgments and Decisions
- Solve Problems

Communication and Collaboration

- Communicate Clearly
- Collaborate with Others

INFORMATION, MEDIA & 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 & CAREER SKILLS**Flexibility and Adaptability**

- Adapt to Change
- Be Flexible

Initiative and Self-Direction

- Manage 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